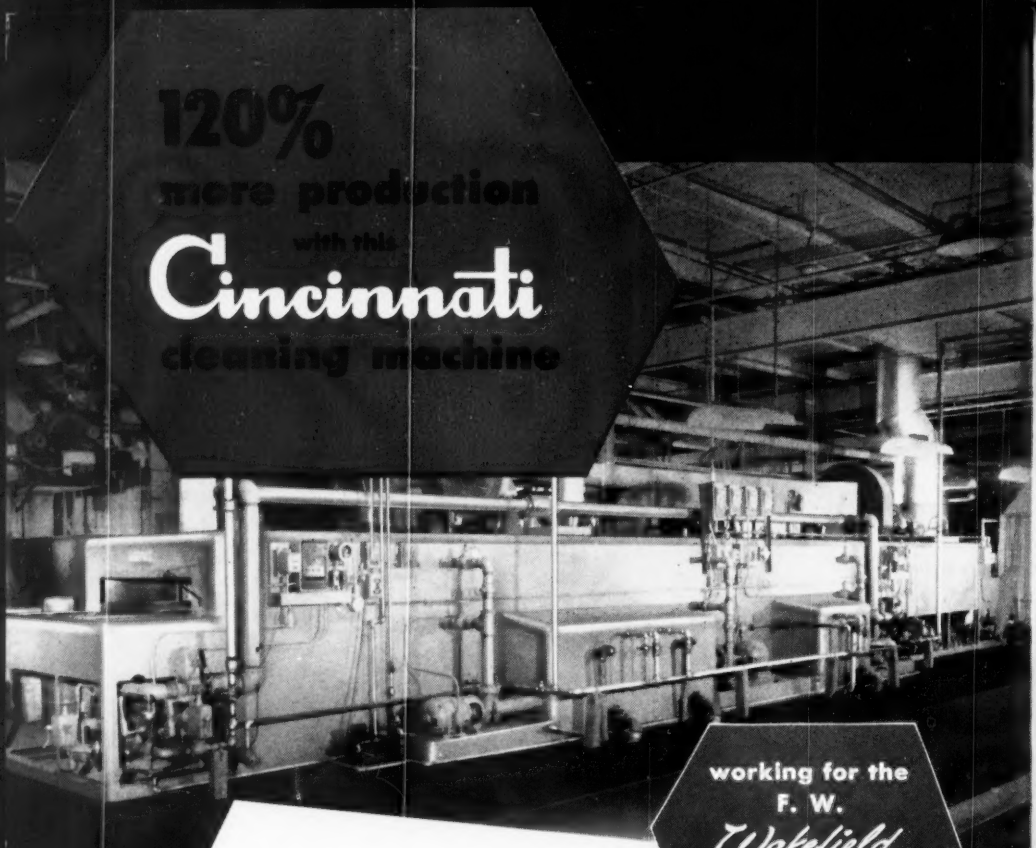
Products Finishing

CLEANING
PLATING
POLISHING
FINISHING

NOVEMBER 1952



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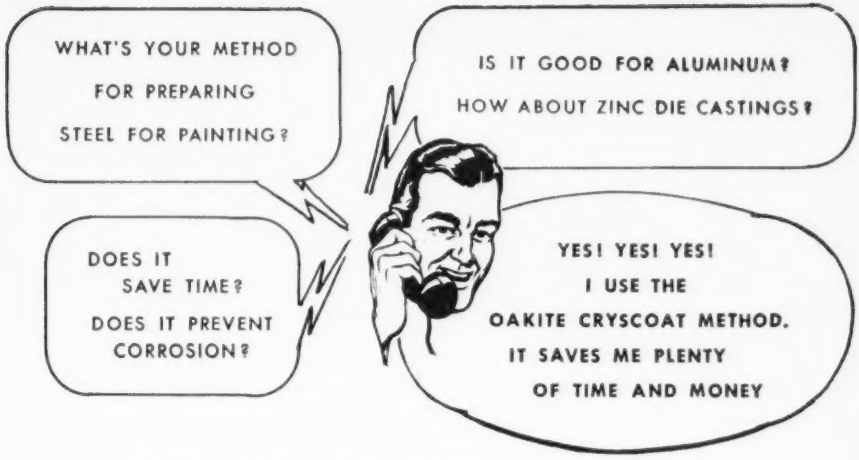
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(On leave of absence
U. S. Air Force)

Products Finishing

November 1952
VOLUME 17 • NUMBER 2

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Associate Editor

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Consulting and Contributing Editors

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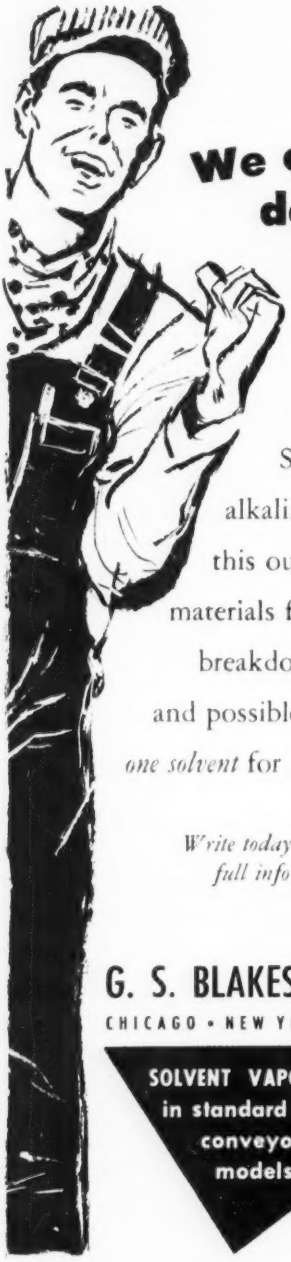

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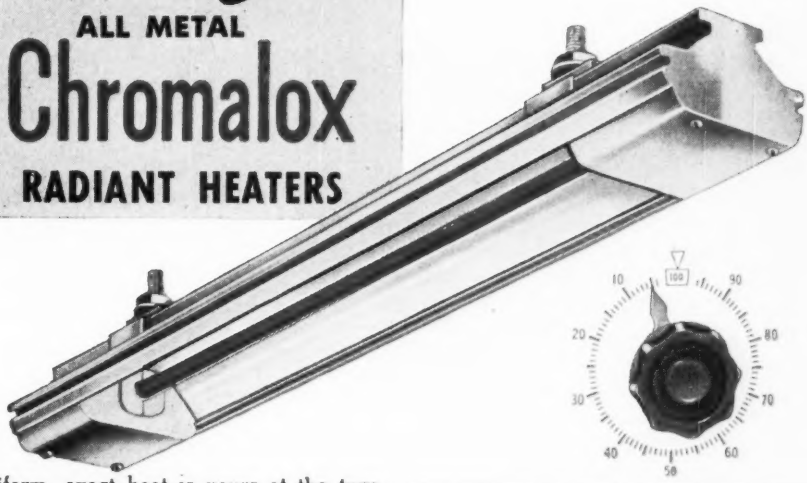

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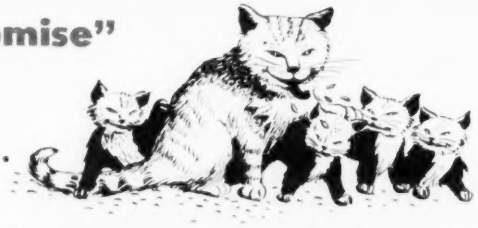

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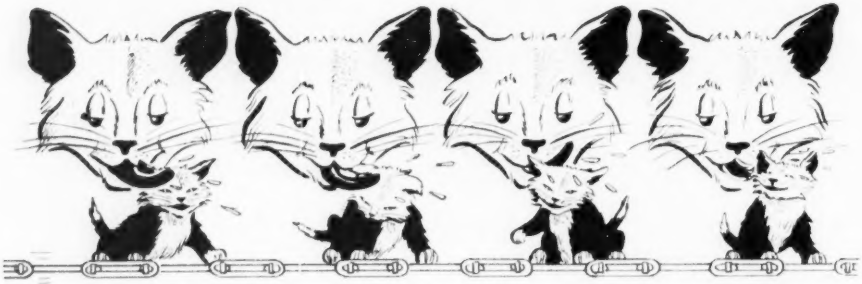

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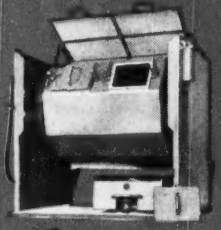

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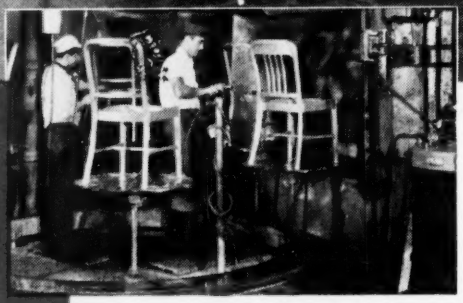

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Maker

Of Metal Office Furniture

Uses Pittsburgh Enamels

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THERE is no better proof of the quality and performance of Pittsburgh Industrial Finishes than the continued use of these famous coatings by outstanding manufacturers.

For instance, the Forbes Finishes Division has furnished the General Fireproofing Company of Youngstown, Ohio, Pittsburgh Industrial Enamels for many years to make its products look better and last longer. Recognized as the world's largest manufacturer of metal desks and office chairs, General Fireproofing is famous also as the maker of one of the finest complete lines of steel and aluminum furniture for trains, buses, steamships, hotels, banks, and other installations.

By working with GF's technical and engineering staff, Pittsburgh has produced high quality enamels to meet General Fireproofing's finishing requirements. These coatings provide exceptional adhesion, toughness, and durability. Because they are so easy to apply, they speed up production and save manufacturing costs.

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General Fireproofing is just one of many manufacturers with whom Pittsburgh has worked in developing highly specialized finishes. This broad experience may be helpful in saving you time and money. Write, wire or phone the Pittsburgh Paint plant nearest you. We'll be glad to have one of our engineers discuss your finishing problems with you at no cost or obligation.

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Technical Service Data Sheet

Subject: METAL PRESERVATION AND PAINT PROTECTION WITH ACP PHOSPHATE COATING CHEMICALS

Ordnance products are now given a protective phosphate coating for extra durability under all kinds of severe exposure conditions. Both military and civilian applications of ACP phosphate coating chemicals are shown in the chart below.

SELECTION CHART OF ACP PROTECTIVE COATING CHEMICALS FOR STEEL, ZINC, AND ALUMINUM

METAL	ACP CHEMICAL	OBJECT OF COATING	TYPICAL METAL PRODUCTS TREATED	GOVERNMENT SPECIFICATIONS
STEEL	"GRANODINE" Zinc Phosphate Coating Chemical	Improved paint adhesion	Steel, iron, or zinc fabricated units or components; automobile bodies, refrigerators, washing machines, cabinets, etc.; projectiles, rockets, bombs, rifles, small arms, belt links, cartridge tanks, vehicular sheet metal, tank bolts and links, recoilless guns, etc.	MIL-S-5002 JAN-C-490, Grade 1 JAN-F-495 U.S.A. 57-0-2, Type II, Class C U.S.A. 51-70-1, Finish 22.02, Class C U.S.A. 50-60-1 16 E4 (Ships)
	"PERMADINE" Zinc Phosphate Coating Chemical	Rust and corrosion prevention	Nuts, bolts, screws, hardware items, tools, guns, cartridge clips, fire control instruments, metallic belt links, steel aircraft parts, certain steel projectiles and many other components.	MIL-C-16232 U.S.A. 57-0-2, Type II, Class B U.S.A. 51-70-1, Finish 22.02, Class B Navy Aeronautical M-364 U.S.A. 72-53 (See An-F-20)
	"THERMOIL-GRANODINE" Manganese-iron Phosphate Coating	Wear-resistance anti-galling, safe break-in of friction or rubbing parts. Rust proofing.	Friction surfaces such as pistons, piston rings, gears, cylinder liners, camshafts, tappets, crankshafts, rocker arms, etc. Small arms, weapon components. Hardware items, etc.	MIL-C-16232 U.S.A. 57-0-2, Type II, Class A U.S.A. 51-70-1, Finish 22.02 Class A Navy Aeronautical M-364 U.S.A. 72-53 (See AN-F-20)
	"GRANODRAW" Zinc-iron Phosphate Coating	Improved drawing, extrusion, and cold forming	Blanks and shells for cold forming, heavy stampings; tubs; tubing for forming or drawing; wire; rod; etc.	———
ALUMINUM	"ALODINE" Protective Coating	Improved paint adhesion and corrosion resistance	Aluminum products of similar design such as refrigerator parts, wall tile, signs, washing machine tubs, etc; aircraft and aircraft parts; bazookas (rocket launchers), helmets, belt buckles, clothes dryers, clothesline, rocket motors, etc., aluminum strip or sheet stock.	MIL-C-5541 (See also QPL-5541-1) MIL-S-5002 AN-F-20 U.S. Navord O.S. 675 16 E4 (Ships) AN-C-170 (See MIL-C-5541) U.S.A. 72-53 (See AN-F-20)
ZINC	"LITHOFORM" Zinc Phosphate Coating Chemical	Improved paint adhesion	Zinc alloy die castings; zinc or cadmium plated sheet or components; hot dip galvanized stock; galvanneal; signs; siding; roofing; galvanized truck bodies; etc.	QQ-P-416 RR-C-82 JAN-F-495 AN-F-20 U.S.N. Appendix 6 U.S.A. 72-53 (See AN-F-20)

CHEMICALS ACP PROCESSES

WRITE FOR DESCRIPTIVE FOLDERS ON THE ABOVE CHEMICALS AND FOR INFORMATION ON YOUR OWN METAL PROTECTION PROBLEMS

CHEMICALS ACP PROCESSES

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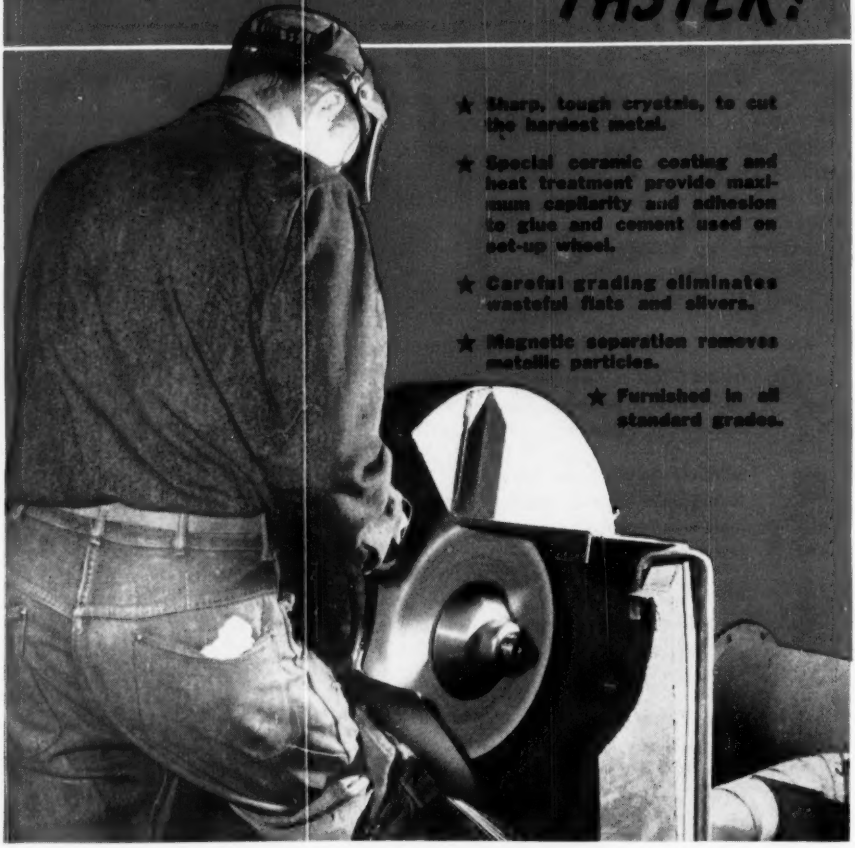

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HOT Lacquer NEWS

PUBLISHED PERIODICALLY BY HERCULES POWDER COMPANY IN THE INTERESTS OF BETTER FINISHES AND FINISHING

Wurlitzer Piano Finishing Rate Up 33% with Hot-Spray Lacquer

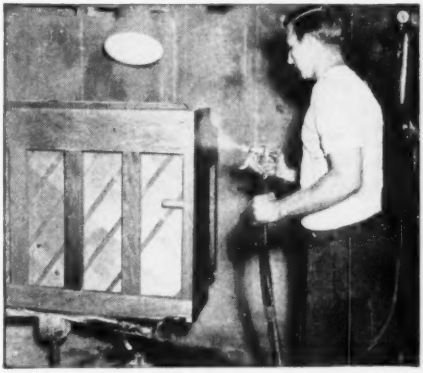
Quality Finish Also Cuts Rubbing and Handling Time

Before specifying hot lacquer, the finishing department in the Rudolph Wurlitzer piano factory at DeKalb, Illinois, put out 160 pianos in a 12-hour day. Since switching to the hot-spray process, the same number of pianos are now finished in a normal 8-hour day. Hot lacquer not only gives the famous Wurlitzer a better finish with fewer rejects, but also reduces application time. Because a piano is a large item, this faster finishing alleviates a floor space problem in the bargain!

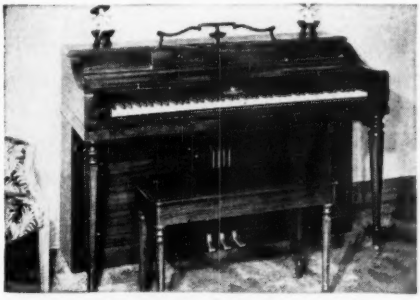
Cellulose Products Department

HERCULES POWDER COMPANY
INCORPORATED

927 Market Street, Wilmington 99, Del.



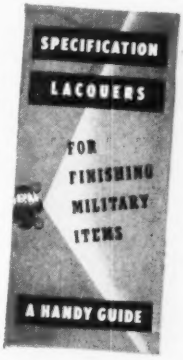
After case parts of the piano are assembled, final coats of hot gloss lacquer are applied.



Completed upright with hot lacquer finish.

Specification Lacquers for Finishing Military Items

Learn more about lacquer for defense finishing. Send for this handy guide to specification lacquers that helps you decide which finish you will need in performing government contracts. Specification numbers are listed, as well as an index to uses.



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Hercules does not make spraying equipment, only the ingredients from which lacquers are made.

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pf editorial

NOVEMBER, 1952

Vol. 17, No. 2

Sayonara.....

This message is addressed primarily to the Japanese readers of PRODUCTS FINISHING, yet may serve as an "open letter" to all. I should like to take this opportunity to say, "Sayonara", (Good-bye) to the group of electroplaters who were so kind to me during my year of service in Japan.

They arranged visits to many manufacturing plants, so that I could see their methods of fabricating and finishing, whether by spray painting, electropolishing, anodizing, porcelain enameling, or electroplating. Dr. Sakae Tajima accompanied me on many of my plant visits, devoting his own time unsparingly for that purpose, and acting as interpreter so that details of certain processes could be discussed fully.

The Japanese finishers were most appreciative of my suggestions for possible improvements in their methods, and entertained me with traditional Japanese courtesy and sociability. Many owners of plating supply companies, manufacturing plant executives, importers and exporters were equally gracious.

The members of the Japan Electroplating Society elected me to honorary membership in their organization. This expression of their regard is indeed appreciated.

Although my contacts were limited generally to the Tokyo area, the Osaka electroplaters had arranged for me to make a week's tour of their area, with

a full program of plant visits and meetings. The privilege of this experience was denied me however, since I was returned to the U. S. on emergency leave prior to the date set for my visit to Osaka. I know that I should have enjoyed meeting the Osaka group, and that I would have been treated just as courteously and graciously as I have been treated by the electroplaters and finishers of Tokyo.

"Interesting" is an inadequate word to describe my year of service in Japan and my association with Japanese interested in the finishing field; it was a very rich experience. I regret that all the readers of PRODUCTS FINISHING could not have had the same experience; however, from time to time I shall continue to try to share it with you.

And so, to the men of the finishing industry in Japan who did so much to give me this memorable experience, I express my sincere and hearty thanks. I shall never forget your kindness.

Ezra A. Blount

—EDITOR

(Below)—Representatives of Nihon Mekki Kyokai (Japan Electroplating Society) who accompanied me to Haneda airport on October 7 for a last "Good-bye". (Left to right):—Mr. Nakamura, Mr. Osawa, Mr. Takahama (editor of "Mekki"), your editor, Mr. Kojima, Mr. Fukui. Not shown in this photograph: Dr. Sakae Tajima.

(Photos by Mr. N. Osawa)

Practical Methods for Determining Impurities in Nickel Plating Baths

SILICA can be easily determined by either gravimetric or colorimetric methods.

Colorimetrically, soluble silica is determined by measuring the amount of incident light absorbed by yellow silico-molybdate complex – the reaction product of ammonium molybdate and silicic acid.

The gravimetric method requires that silica be dehydrated with perchloric acid, filtered, ignited and weighed. After being volatilized with hydrofluoric acid and reweighed, difference in weight shows the true amount.

SODIUM and POTASSIUM are revealed by using flame photometry. The diluted bath sample is atomized in the flame photometer. Intensity of the characteristic light of either sodium or potassium is measured with respect to a standard. Concentration of the ion in the diluted sample is read off a calibration curve.

CADMIUM can be determined after copper and iron are removed by precipitation with cupferron and extraction with amyl acetate. Cadmium is precipitated with 2-mercaptobenzothiazole in an ammoniacal solution and extracted with chloroform. Then it is returned to an aqueous medium by shaking the extract with hydrochloric acid. The solution is made strongly alkaline with sodium hydroxide solution and the cadmium is extracted with a carbon tetrachloride solution of dithizone. After dilution, the extinction of the colored system is measured.

ALUMINUM may be determined colorimetrically after removing interfering metals. Color of the aluminon lake is developed by adding aluminon and a buffer to adjust pH to 5.5 and transmittancy of the lake is measured with a colorimeter.

AMMONIUM is separated from the bath by alkali treatment and steam distillation with a micro Kjeldahl apparatus. The ammonia is treated with Nessler's reagent, and the color developed is measured photometrically.

CHROMIUM: To determine chromate chromium, any reducing agents are oxidized with nitric acid. Diphenylcarbazide is added, the transmittancy of the solution is measured, and the amount of CrO_3 present as chromate read off a calibration curve.

For total chromium, any iron, organic compounds, reducing agents, and chlorides are removed, after which the chromium is oxidized with ammonium persulfate. Transmittancy of the solution is measured and the amount of CrO_3 read off a calibration curve.

ZINC is determined colorimetrically. Copper and iron are first removed; then heavy metal impurities including nickel are complexed with sodium di(B-hydroxyethyl)dithiocarbomate. Zinc dithizonate is formed in the presence of these complexes, when a carbon tetrachloride solution of dithizone is added. After removal of excess dithizone, zinc is determined colorimetrically.

CALCIUM is determined by precipitating the heavy metals as hydroxides, and then separating the calcium from the filtrate by precipitating it as the oxalate at a controlled pH. The calcium oxalate is converted to oxalic acid, and the acid is allowed to reduce a known amount of potassium permanganate. Transmittancy of the residual potassium permanganate solution is then measured.

A.E.S. RESEARCH PROGRAM

The American Electroplaters' Society is conducting a comprehensive research program and has developed useful information on current plating problems. International Nickel, in addition to its other support of this program, feels that it will be a further service to make copies of these A.E.S. Research Reports available.

For an authoritative, detailed, 84-page study of this subject, we offer you a free copy of the A.E.S. Research Report, Serial No. 6, entitled *"Determination of Impurities in Electroplating Solutions."* Use the coupon now.

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Please send me a copy of A.E.S. Research Report, Serial No. 6, entitled "Determination of Impurities in Electroplating Solutions."

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NOVEMBER 20-22

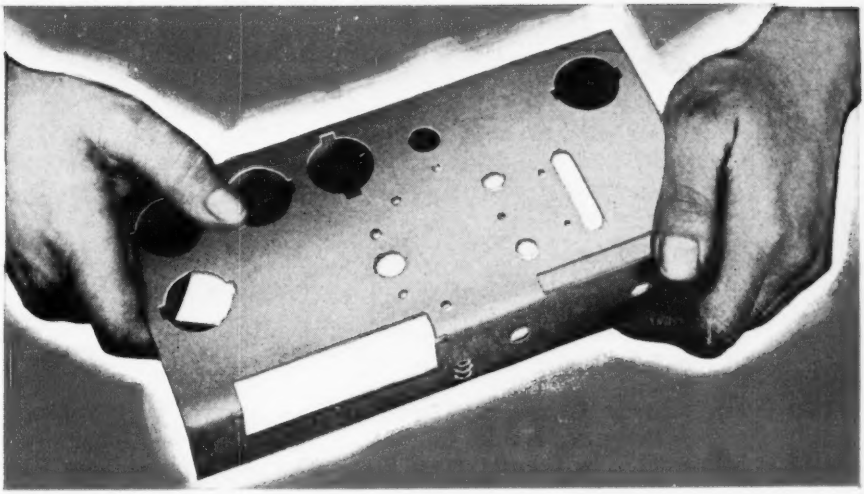
WEDNESDAY, NOVEMBER 19

9:30 A.M. Paint Industries' Show Opens
1:00 P. M. Registration Opens
2:00 P. M. Council Meeting
5:00 P. M. Registration Closes
6:00 P. M. Council Dinner
Paint Industries' Show Closes

THURSDAY, NOVEMBER 20

MORNING SESSION—H. G. SHOLL Presiding

8:00 A.M. Registration Opens
9:30 A.M. Paint Industries' Show Opens
10:15 A.M. Greetings—H. P. BALL, *President*
Introduction of Committee Chairmen
10:30 A.M. Welcome—C. J. OVERMYER, *Chairman of Meetings Committee*
H. H. ZIMMERMANN, *Chairman of Host Committee*
E. H. OTT, *Chairman of Paint Industries' Show Committee*



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11:00 A.M. "Factors Affecting the Heat Thickening of Linseed Oil"—DR. A. J. SEAVELL and DR. J. J. SLEIGHTHOLME, of Oil and Colour Chemists' Association. To be presented by L. O. KEKWICK, *President of the London Section of OCCA.*

11:25 A.M. "Instrumentation for Continuously Recording Viscosity of Resins and Polymers in Large Reactors at Processing Temperatures"—Chicago Club. D. T. WOODS, *Chairman of Technical Committee*

11:45 A.M. "A Study of Factors Affecting Heat Resistant Coatings"—Houston Club. J. E. RENCH, *Chairman of Technical Committee*

THURSDAY AFTERNOON SESSION—L. E. LUDWIG Presiding

2:00 P. M. "The Effect of Protein Dispersions on the Freeze-Thaw Stability of Latex Emulsions"—Northwestern Club. J. B. KENNEY, *Chairman of Technical Committee*

2:20 P. M. Keynote Address—"Research and Education"—DR. J. S. LONG, of Devoe & Raynolds Co., Inc.

2:55 P. M. Address by J. F. BATTLEY, *President of the National Paint, Varnish and Lacquer Association*

3:15 P. M. Education and Student Session. M. A. GLASER, *Chairman of Federation Educational Committee,* will describe the "Paint Course Package" for Paint Technology Course. DR. J. W. TOMECKO, *of Educational Committee*—"Paint Education on a High School Level." DR. J. T. RETTALIATA, *President of Illinois Institute of Technology*—"Cooperation Between Industry and Education"

4:25 P. M. Round Table Discussion—"Latex Paints"—M. W. WESTGATE, *Moderator;* H. L. BEAKES, F. J. HAHN, P. C. HERZOG, P. T. HOWARD, D. A. KOHR, JR., R. E. MARSHALL, M. H. P. MORAND

5:00 P. M. Registration Closes

6:00 P. M. Paint Industries' Show Closes

8:30 P. M. Annual Bridge Tournament—Private Dining Room 14

FRIDAY, NOVEMBER 21

MORNING SESSION—M. VAN LOO Presiding

9:00 A.M. Registration Opens

9:30 A.M. Paint Industries' Show Opens

10:00 A.M. "A Study of Pigment Dispersion: IV"—New York Club. E. K. ZIMMERMAN, *Chairman of Subcommittee 53*

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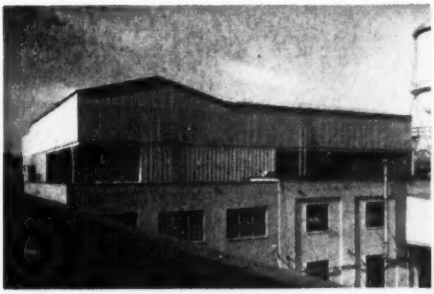

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Representatives in Principal Cities

10:20 A.M. Report of Research Committee—P. O. BLACKMORE, *Chairman*

10:40 A.M. Report of Evaluation Committee—W. O. LUNDBERG, *Chairman*

11:00 A.M. "Permeability to Water of Thin Films of Pure Compounds"—B. L. HARRIS and A. BIALECKI, *of The Johns Hopkins University*

11:20 A.M. "Painting of Plaster Surfaces: I"—Cleveland Club. A. J. WANDERSLEBEN, *Chairman of Plaster Research Committee*

11:40 A.M. The Joseph J. Mattiello Lecture—"Unexplored Fields in Exterior Paints"—JOHN R. MACGREGOR, *of J. R. MacGregor Lead Co.*

FRIDAY AFTERNOON SESSION—H. KELFER Presiding

2:00 P. M. "The Relationship of Plant and Finished Product Warehouse Capacity"—New England Club. R. W. GEORGE, *Chairman of Plant Managers' Committee*

2:20 P. M. The Color Symposium Featuring the Federation Color Aptitude Test. Introduction by P. O. BLACKMORE. Addresses by DR. D. L. DIMMICK and C. E. FOSS

4:10 P. M. Annual Business Meeting—Report of Election—Federation Business—Announcements

4:40 P. M. Round Table Discussion—"Corrosion"—G. DIEHLMAN, *Moderator;* T. DEMBSKI, A. J. LIEBMAN, F. T. RADECKE, F. C. WEBER, JR.

5:00 P. M. Registration Closes

6:00 P. M. Paint Industries' Show Closes

6:30 P. M. Annual Banquet—Installation of Officers—Awards and Entertainment

10:00 P. M. Informal Dance

SATURDAY, NOVEMBER 22

W. C. KENTNER Presiding

9:00 A.M. Registration Opens

9:30 A.M. Paint Industries' Show Opens
"Comparison of Representative Latex Emulsion and Oleoresinous Flat Wall Paints"—Baltimore Club. R. L. MCGILL, *Chairman of Technical Committee*

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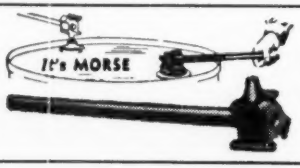

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9:50 A.M.	Round Table Discussion—"Pigment Dispersion"—H. KELFER, *Moderator;* A. BARKMAN, W. H. HOBACK, C. B. HOFFMAN, D. E. LEEVER, O. F. REDD
11:00 A.M.	"Quick Specific Qualitative Tests for the Determination of Characteristic Components in Vehicles or Synthetic Resins"—C.D.I.C. Club. G. SCHUTTE, *Chairman of Technical Committee*
11:20 A.M.	"Comparative Effect of Oil Acidity and Resin Acidity in Aluminum Vehicles"—Pittsburgh Club. C. N. BECK, *Chairman of Technical Committee*
11:40 A.M.	"Testing of Amino Resins for Stoving Finishes"—Birmingham Club. J. N. HITCHIN, *Chairman of Technical Committee*
12:00	"Dry Hiding Power of Paints: II"—New York Club. E. J. DUNN, JR., *Chairman of Subcommittee 40*
12:20 P. M.	Round Table Discussion — "Gadgets and Gimmicks" — W. C. KENTNER, *Moderator;* R. G. FORTENER, J. R. KOHR, E. R. MUELLER, W. E. WINKLER
3:00 P. M.	Meeting Closes

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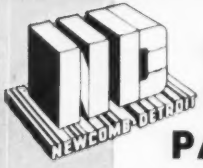

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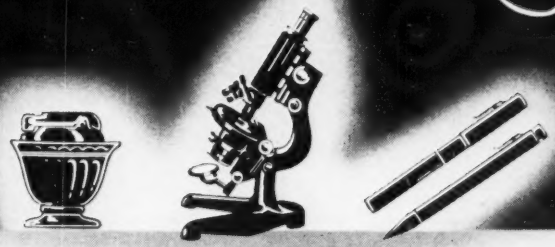

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PALMER HOUSE, NOVEMBER 18-22, 1952

Paul O. Abbe, Inc. 14
Advance Solvents & Chemical Corp. 99-100
C. M. Ambrose Co. 34-35
American Cyanamid Co. 61-62
Anderson Prichard Oil Corp. 70
Ansbacher Siegle Corp. 26
Archer-Daniels-Midland Co. 68
Atlas Electric Devices Co. 18
Bakelite Division 2-3-4-5
Baker Castor Oil Co. 24
Bede Industrial Products, Inc. 90
Bennett Industries, Inc. 83
Binney & Smith Co. 66
Bowser, Inc. 67
Burt Machine Co. 36-37
Carbide & Carbon Chemicals Co. 97
Chisholm Ryder Co. of Penna. 84
Cuno Engineering Corp. 63
J. H. Day Co., Inc. 44-45
Diamond Alkali Co. 43
Dow Chemical Co. 75-76
Edgar Brothers Co. 69
Epworth Manufacturing Co. 53
Falk & Co. 7-8
Ferro Chemical Corp. 41-42
General Electric Co. 47-48
Goodyear Tire & Rubber Co. 6
Gray Co., Inc. 29
Harshaw Chemical Co. 91-92
Hercules Filter Corp. 74
Hercules Powder Co. 1
Herman Hockmeyer & Co. 85-86
Spencer Kellogg & Sons, Inc. 57-58
Kent Machine Works 49
Kinetic Dispersion Corp. 79
Krumbhaar Chemicals, Inc. 82
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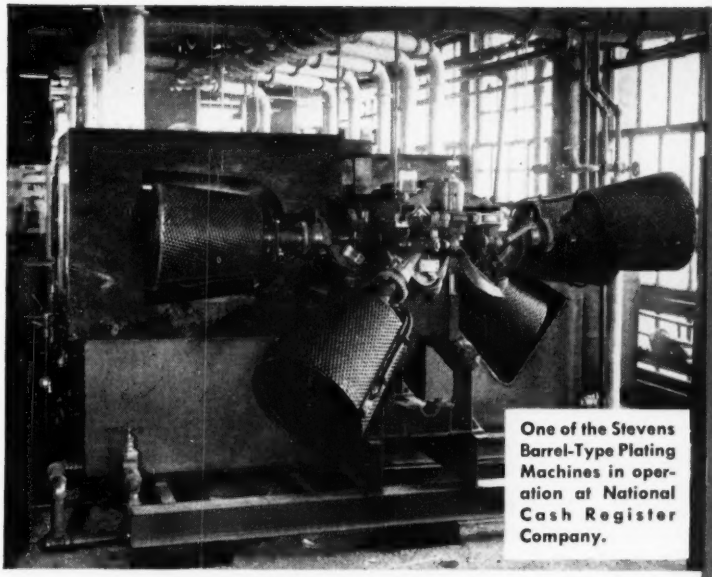
Lead Industries Association 59-60
J. M. Lehmann Co., Inc. 73
Metals Disintegrating Co., Inc. 25
Mineral Pigments Corp. 50
Moisture Register Co. 81
Monsanto Chemical Co. 402-403
Morehouse Industries 95-96
Naftone, Inc. 65
Neville Co. 19-20
Norcross Corp. 89
Nuodex Products Co., Inc. 93-94
Plaskon Division 39-40
R-B-H Dispersions 13
Reichhold Chemicals, Inc. 9-10-11-12
Rohm & Haas Co. 55-56
Charles Ross & Son Co. 64
Ross & Rowe, Inc. 98
Shell Chemical Corp. 15-16-17
Shell Oil Co. 51-52
Sparkler Manufacturing Co. 46
Tennessee Eastman Co. 21-22
Arthur C. Trask Co. 77-78
Troy Engine & Machine Co. 80
U. S. Industrial Chemicals Co. 23
U. S. Stoneware Co. 71-72
Union Bag & Paper Corp. 88
Upressit Products Corp. 28
T. F. Washburn Co. 27
C. K. Williams & Co. 87
Witco Chemical Co. 54



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Hard Chrome Plating on Aircraft Parts

By GILBERT C. CLOSE

HARD chrome plating is a very useful process. It's near perfect in certain applications. But using and handling the process requires iron-fisted control and the application of common sense at all times. The qualities usually required of a hard chromium deposit are exacting and severe. Unauthorized or untested deviations from process requirements many times cause inferior results.

These comments are based on years of experience in hard chrome plating to necessarily rigid and exacting government specification requirements. Many hard chromium plated parts used in aircraft and airplane engine construction would endanger the airplane and crew in event of failure at a critical moment. There is no room for error in this type of work. It's not a case where the defective part can always be removed, stripped and re-plated. In aircraft applications, the job must be done right the first time.

In a general review of the various quality control measures being enforced by West Coast aircraft manufacturers employing the hard chromium plating process, it was found that techniques and practices were generally uniform. Minor controls vary to some extent, but all are aimed at obtaining the same superior results. The same holds true for the numerous job shops doing hard chrome plating on a sub-contract basis for the various aircraft firms. This consistency indicates quite clearly that standardized procedures, omitting nothing that will ensure better quality and full recognition of process limitations, are necessary when best results are desired.

It is the purpose of this article to outline the various control measures and the handling of work as practiced in the aircraft industry in hard chromium plating applications. In general, these controls apply to both production and maintenance plating. In some companies, production plating and maintenance or salvage plating is accomplished with the same equipment; in other companies maintenance departments have their own plating facilities, but generally adhere to the process techniques employed in production plating.

Preparation for Plating

To begin with, proper preparation of the part to be plated is given maximum attention. This is because of the

poor throwing power of the chromium plating solution, and its tendency to emphasize any defects or surface irregularities on the unplated parts. Checks, pits, scratches or ridges on the base metal will, if anything, be exaggerated on the surface of the plated deposit. Thus it is necessary that the surface on the unplated part or tool be as good or better than the surface finish expected after plating.

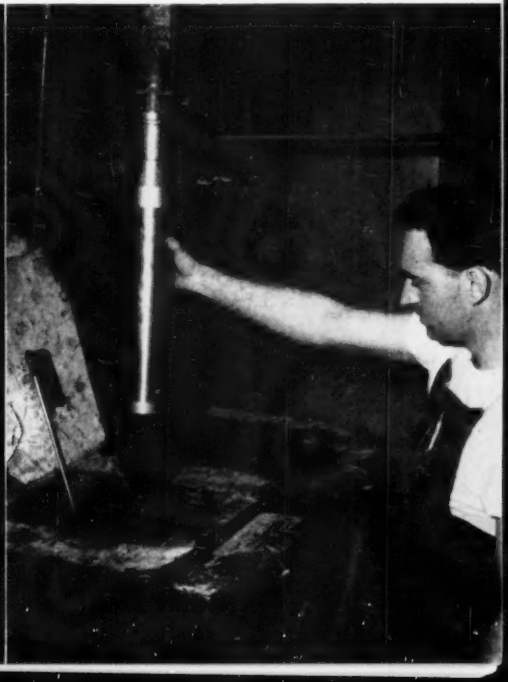
The degree of preplating surface finish depends, of course, on permissible tolerances and the degree of finish required on the plated part. It is pointed out by platers with long experience that it is much easier to properly prepare the surface beforehand than to attempt to grind or buff away surface irregularities after plating. Furthermore, grinding or buffing after plating may remove all the plated metal from specific small areas, thus leaving the base metal exposed, and minus the benefits of the plated deposit.

For ordinary work, what is termed a "smooth" preplating finish is generally used. For more critical work, a "light buff" preplating finish is usually specified. When the plated tolerances are very narrow, or when the ultimate in plate smoothness is desired, what is termed a "high color buff preplating finish" is employed. Specifically, the "high color buff" indicates that the part or tool must be made as smooth as possible prior to plating. A more exact system employed is to specify the maximum allowable surface roughness as determined by a suitable measuring device.

A second major consideration has to do with proper cleaning of the part to be plated. This is generally quite

Fig. 1 (left)—Masking off areas on a large hydraulic piston to be hard chromium plated. Both masking tape (upper section), and thin sheet metal held in place with fine wire (lower end) have been used.

Fig. 2 (right)—Dipping a hydraulic piston in masking lacquer. Note that sheet metal masking material has been used to obtain a clean demarkation between plated and unplated areas.



simple on production work, but in maintenance plating or tool salvage work where the part has been exposed to many types of soil during its service life, cleaning is often complex.

For production work, an alkaline cleaning bath, or a vapor degreaser using a trichlorethylene solvent solution, will usually suffice. In maintenance work, sandblasting is often used to remove heavy rust, oxides and surface scale. Lighter rust accumulations and light scale are removed in a nitric acid pickling bath.

Very few parts or tools require overall plating and consequently, masking off of areas where no deposit is desired, is necessary. Several commercially available masking materials are used for this purpose including masking tapes that are resistant to the chromium plating bath. Various stop-off lacquers are also used. Quite satisfactory is an insulating wax, whose melting point is above the temperature of the chromium plating solution, yet below 212 deg. F., so that it can be melted off in boiling water. Another commonly used masking technique is to wrap thin sheet metal around the area to be masked. This is held in place by fine wire (see Figs. 1 and 2). While the plating solution will seep behind the sheet metal wrapping, no chromium will be deposited on the masked-off surface. Any barrier inserted between the anode and work surface will effectively block off plating on that specific protected area.

After cleaning and masking, the parts or tools to be plated must be attached to the suspension fixtures in a manner to secure maximum electrical contact and conductivity. The current densities used in hard chromium plating are very high, and poor contact between the part and its suspension fixture will not only cause inferior results, but may cause arcing and burning. When at all possible in aircraft plating work, a bolt-and-nut or stud bolt is used to attach the part to the fixture (see Fig. 3). When drawn tight, such an attachment device, provides solid contact pressure.

The fixture must be attached to the part in a manner to avoid current density concentrations along sharp edges or through abrupt changes of cross section. Furthermore, the

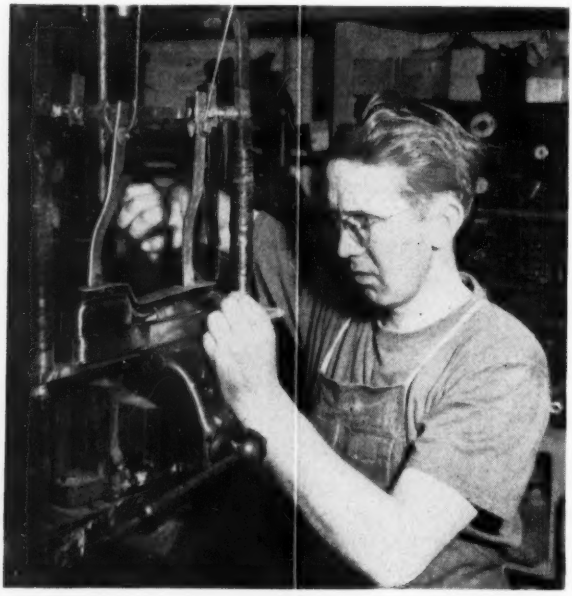


Fig. 3—Attaching a suspension fixture and anode to a draw die to be hard chromium plated. Bolt-and-nut or stud bolt attachment is used when practical to secure a solid contact. Anode spacing is critical, and is about ¼-inch in the general run of work. Note rack insulation on cathodic portions of rack.

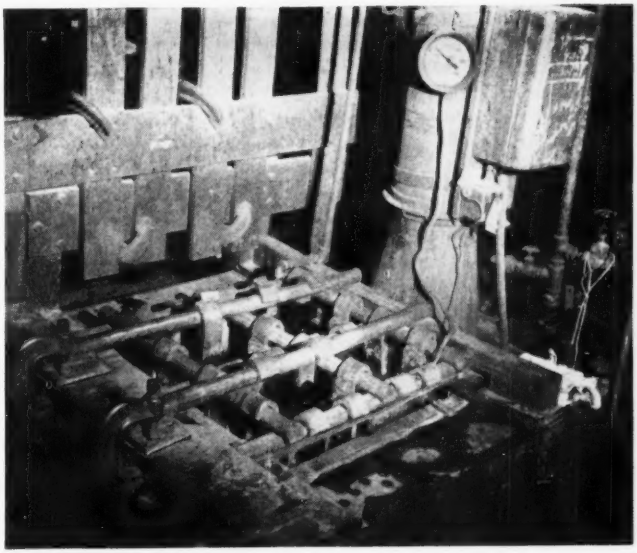


Fig. 4 — This heavy bus installation providing a maximum of contact area, furnishes heavy current densities without heat or loss to the 16-foot deep plating tank. This type of equipment is employed for plating long, thin parts such as shafts, and rods.

attachment must be sufficiently rigid to avoid tearing or rupture of the masking material. Providing a low-resistant path for the heavy current is a necessary requisite for good plating results. Anything that interferes with, unduly concentrates, or by-passes this current will be reflected in the plating deposit.

Final cleaning of the part or tool, after mounting it on the suspension fixture, is considered an important and necessary process step in aircraft plating work. This is generally accomplished in an ordinary standard soap bath operated at about 180 deg. F. This final cleaning removes any surface film not previously removed, and any dirt deposited during the masking and mounting operations. Only a chemically clean surface will accept the chromium deposit in a manner to obtain optium results.

Plating Procedure

In actual plating, the part or tool is first given a chromic acid etch in a standard 33 oz./gal. chromic acid solution operated at 130 deg. F. From 1 to 2 amp./sq. ft., reverse current, applied at from 4 to 6 volts d.c. is used to etch the low carbon steels, with a slight increase in voltage for high carbon alloys. After etching, the part is placed in a standard chromium plating solution.

Temperature control and solution concentration are considered highly critical by experienced platers, and every effort is made to keep both within specification requirements. Automatic temperature control devices are generally employed to maintain the desired solution temperature. Chemical analysis at frequent intervals aids the plater in maintaining uniform solution concentration.

In most routine plating work, current densities of around 300 amperes per square foot of work surface are maintained during the first hour of plating, then this density is tapered off so that plating progresses at the rate of approximately 0.001 inch of plated deposit per hour. Operators advise against the plating of very small parts alongside large parts as the smaller units will attract greater current density.

Despite contrary opinions, it has

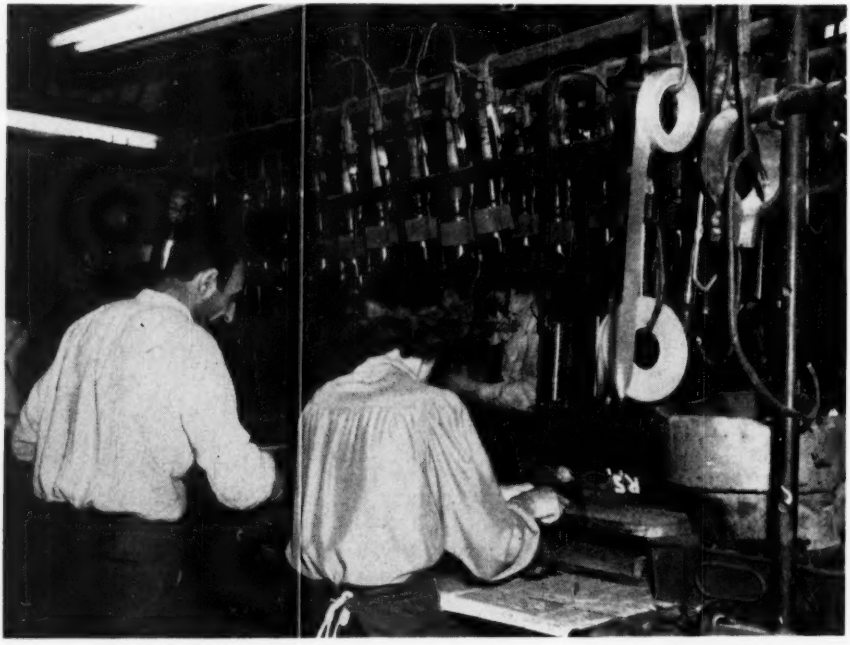
been found completely practical to remove parts from the plating bath during plating to check them for size and inspect the progress of the deposit. This is practiced continually in aircraft plating where the best possible results are demanded. It is also practical to insert new work along with partially plated parts, but this must follow a definite procedure.

The unplated part is first put into the plating bath and allowed to come to bath temperature. The current is then increased to "start plating" densities of around 300 amperes per square foot of work surface, but as the current cannot be reversed at this point for last minute cleaning (due to the partially plated parts present), the new work should be transferred to the anode for from 20 to 30 seconds. It is then returned to the cathode bus and plating procedes as usual.

Despite the tendency toward strict formula plating, a few special techniques are sometimes employed. This generally happens in conjunction with salvage and maintenance plating. Cast iron tools or parts, for example, must be hit hard at first to start even overall plating at the same time. This is accomplished by increasing the initial plating current density. Exactly how much to increase it depends upon the part and the experience of the operator.

Some parts or tools may have deep slots or recessed areas that require

Fig. 5—Work bench in a modern chromium plating job shop. Note extensive array of anode shapes, masking tape, deflection screens, and so forth. These racks have each been designed for one specific part, or several that are quite similar. Perhaps the greatest single factor in successful hard chromium plating is that of proper rack design.
(All photos by author.)



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two to three times normal plating current density to obtain a satisfactory deposit. These hard to hit areas may be effectively plated by reducing fixture anode spacing to about $\frac{1}{8}$-inch, rather than the normal $\frac{1}{4}$-inch spacing. Here again operator experience is almost a necessity to obtain the best results. No definite figures for anode spacing are available, and spacing requirements vary with the character of the surface to be plated.

As might be expected, the extreme hardness of the chromium deposit imparts a tendency toward brittleness. When operating under load in the as plated condition, chipping or spalling of the deposit, especially on sharp corners and edges, is very likely to occur. This natural brittleness is further exaggerated by hydrogen embrittlement during plating. This phenomenon is more severe in chromium plating than in most other plating operations due to the relatively low efficiency of the chromium plating solution which results in an excessive formation of hydrogen gas.

In the aircraft industry, or in job shops supplying the aircraft industry with chromium plated parts, a hydrogen embrittlement relief heat treatment is employed on all high carbon and cold rolled steel parts. This is accomplished by heating the plated parts for about three hours at 375 deg. F. While the heat treatment does not reduce the brittleness of the plated metal itself, it removes the brittleness from the underlying surface of the base metal by driving off the hydrogen gas.

A good stripping bath should be kept handy in every chromium plating department. This bath will serve two purposes—to strip defectively plated parts for replating, and to remove old chromium plate from tools and maintenance parts that need replating. It is not advisable to apply new plate over old. An effective stripping bath is com-

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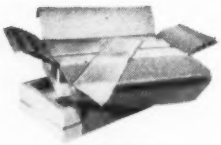

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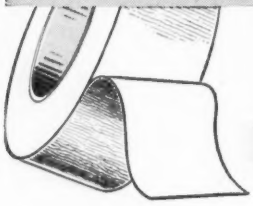

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posed of a sodium hydroxide solution operated at about 100 deg. F., and employing reverse current at 4 to 6 volts. This bath is employed in the Douglas Aircraft Company plating department, and has proved highly efficient in stripping operations.

Despite the utmost care in preparation of the part prior to plating, a certain amount of grinding or buffing will have to be done on some of the work. In grinding, a softer, somewhat more free-cutting wheel should be used than is employed for grinding hardened tool steel. Alumnium oxide has proved to be an excellent abrasive for plated chromium. The wheel should be as free as possible from iron oxides, and 80 to 100 mesh abrasive has been found satisfactory for most work.

In plating cutting tools, the tool should be sharpened prior to plating. This sharp edge will be maintained throughout the plating process and subsequent sharpening will not be necessary. Even worn mill files, if properly cleaned, can be chromium plated to give them renewed usefulness. The deposit exaggerates the slightly worn file roughness, thus restoring the original cutting roughness required for good work.

In very brief summary, the author wishes to point out that no attempt has been made in this article to describe the hard chromium plating process. Rather, the remarks and precautions set forth pertain to use of this process in the aircraft industry where optium results must be obtained. It goes without saying that the same careful techniques and attention to detail will aid others in improving their hard chromium plating.

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

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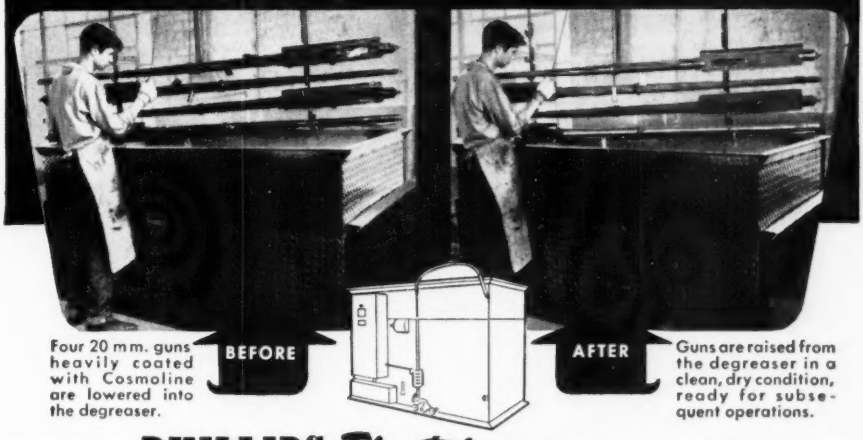

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Here is another instance of how Phillips degreasers cut manufacturing costs through faster, more thorough, more economical metal cleaning. If you have a degreasing problem, check with Phillips. Our engineers will be glad to recommend the right machine for your job from Phillips' complete line of standard degreasers.

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The wide current density range at which the Unichrome Pyrophosphate Copper Process plates smooth and fast is maintained over long periods of continuous operation by an improvement in its makeup.

In addition, this process continues to solve other plating plant problems. It can be used in plastic lined tanks formerly used for nickel. It can be plated directly with chromium, with only simple buffing or chemical polishing if needed. It contains no cyanide to dispose of.

By compensating

Chromium Plating

■ Despite scarcities, many products still offer the powerful appeal of a good quality chromium finish. One method for producing such a finish offers substantial advantages. Corrosion resistance is achieved with alternate materials – copper for the undercoat, organic coating for a topcoat. As for the chromium itself, better, faster plating is being obtained with the Unichrome S.R.H.S. Chromium Bath.

PRODUCTION ADVANTAGES WHEREVER USED

Many plants are plating to specifications with Unichrome S.R.H.S. Chromium 20 to 80% faster than with the ordinary chromium bath – and with less trouble. Self-regulating, it minimizes control and maintains top throwing power. With wider bright plate range, it avoids rejects due to "burning" or "missing." Recent reports give some idea of the great improvements this bath has worked on production, costs, and results:

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Zinc plate, when chemically treated in Unichrome Clear Dip and then fortified with a Unichrome Clear Enamel, provides a substitute finish which can satisfy exacting requirements. The Clear Dip forms a bright-as-chromium finish integral with the zinc, while the clear enamel adds extra wear and corrosion resistance to this protective finish without detracting from its brightness. This finishing system is in widespread use today on zinc die cast and steel products.

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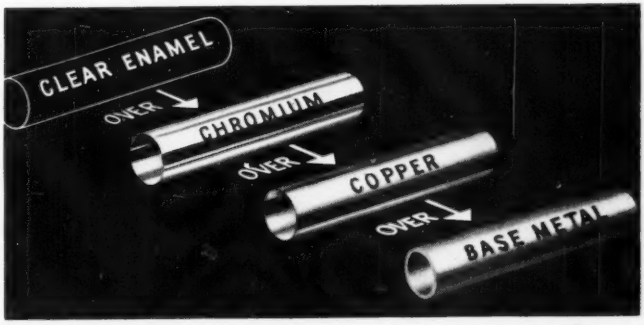
Fishing line guides are plated in 2/3 the time by S.R.H.S. Chromium, and with better coverage and brighter plate. By using this bath, another plant doubled capacity for plating various parts including zinc die castings—and eliminated the former need for special racking. Companies report savings in bath maintenance, too.



A GOOD COPPER UNDERCOAT

Copper plating on zinc die castings and steel contributes to corrosion resistance, and to a brighter finish. Copper deposited from the Unichrome Pyrophosphate bath makes an excellent base for the chromium. If base metal condition and quality requirements permit, it needs no buffing or chemical polishing. If not, it can be easily polished either way.

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Unichrome Clear Coatings were developed especially for use on plated and polished metals. They add extra protection without detracting from brightness.

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For an air dried or force dried finish, Unichrome Coating A-140 provides corrosion-resistance comparable to many coatings that are baked.

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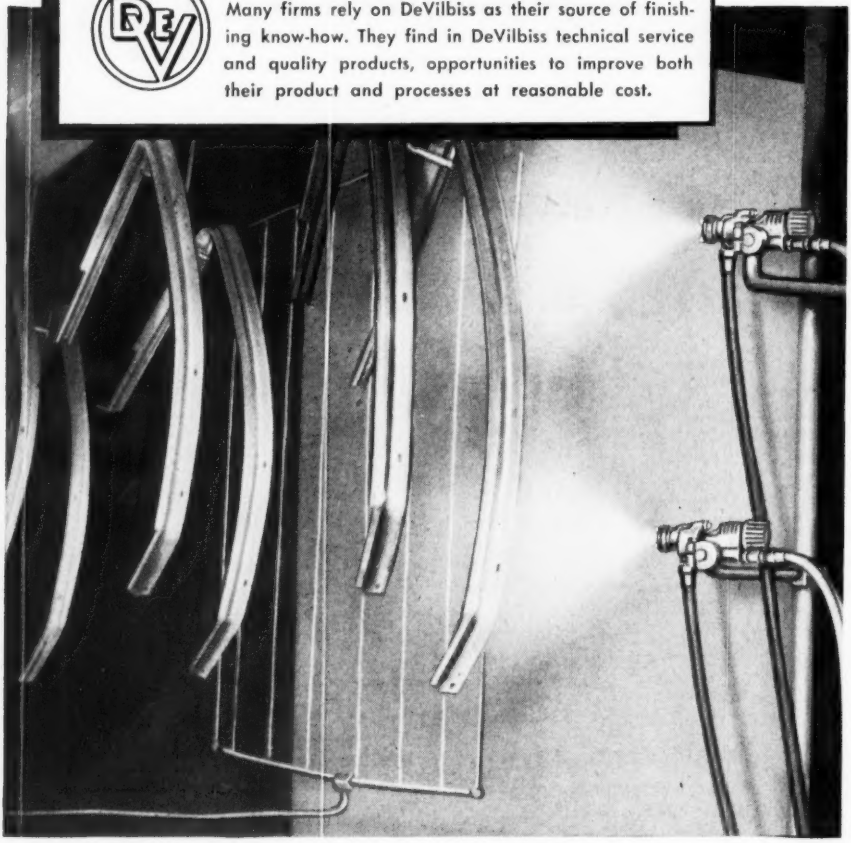

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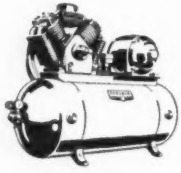

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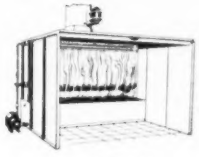

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Performance of Pretreatment Primers as Revealed by Accelerated Weathering Tests

IT is difficult to evaluate paint or enamel finish systems from accelerated laboratory tests. To enable the latter to be sufficiently rapid for reasonably quick decisions to be made, practical conditions to which the finish may be subjected in service have to be accentuated appreciably. These variables may include heat, humidity, wetness, or atmosphere containing salt or other chemicals. Further, the conditions imposed may entail one of these factors, or two or more combined. Conditions of service life can never be foreseen exactly, and moreover, the same equipment can experience different conditions in one environment from what it does in another. Again, an artifically elevated temperature, humidity or other condition may quite rapidly cause disintegration of a finish whereas long exposure under less severe conditions may be without harm; further, the results obtained may bear no relationship to performance in the field.

In consequence, it is generally agreed that finish quality can be determined best from experience. Nevertheless, much invaluable information is obtained from accelerated corrosion tests, particularly if the results obtained and conclusions drawn can be assessed in due course against actual performance. Not only are such tests necessary for making initial decisions, but they are also indispensible for quality control procedures as applied to the paint raw materials and the finishing techniques during the manufacture of the finished product.

The merits of the pretreatment of self-etch primer of the two-solution polyvinyl butyral resin/phosphoric acid type as the foundation for adherent and durable coatings of paint and enamel in industrial finishing have been established by test procedures incorporating mild and severe hot humidity, salt spray and open atmospheric conditions. The indications from the limited number of years of service since these media became available and adopted, are that these special primers represent a notable contribution to the production of serviceable finishes. The results from the tests enumerated have been borne out in practice.

In the following, an examination of test panels by means of the "weatherometer" is dealt with, a commercial pretreatment primer being used. The daily cycle was as follows:—

1. A period of 17 hours with exposure to the light from a carbon arc and

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with light water spray at intervals of 20 minutes.

2. A period of 3 hours with heavy water spray.
3. A period of two hours freezing to just below zero (23 to 32 deg. F.).
4. A two-hour recovery period during which the panels could be examined.

The specimens concerned were submitted to 30 such cycles. The various finishes were represented in duplicate panels, finished on one side only. All the panels were thoroughly cleaned to receive the enamel finishes, and, after finishing, were allowed about a month to fully mature before testing. Two scratches intersecting at an acute angle were made through the finish to the base metal, with the object of accelerating the deterioration of the finish from the center of the panel as well as from the cut edges.

Table I.

CODE LETTERS USED FOR VARIOUS FINISHED PANELS

MATERIAL.	CODE
Aluminum Sheet	A
60/40 Brass Sheet	B
Mild Steel Sheet	S
Hot Tinned Mild Steel	TS
Zinc Plated Mild Steel	ZS
Cadmium Plated Mild Steel	CS
CHEMICAL PRETREATMENT.	
None	O
Phosphatizing	P
Chromate Pickling	Cr.
PRIMER.	
None	O
Aluminum Cellulose Lacquer	Al.
Red Oxide (baked)	R
Pretreatment etch primer	E
FINISHING ENAMEL.	
Celllulose	Cel.
Baking	Ba.

The range of metals used in the tests covered aluminum with and without the chromic/sulfuric acid pretreatment, commercial brass sheet, mild steel sheet with and without an immersion phosphatizing, tinned iron or tinned steel sheet processed by the hot tinning method, and mild steel zinc or cadmium plated, both with or without phosphate pretreatment.

The finishing enamels covered were a baking synthetic urea/alkyd resin type, baking 30 minutes at 250 deg. F., and an ordinary grade cellulose enamel. These were tested with and without primer, the latter being a red oxide modified alkyd type baking 30 minutes at 250 deg. F., an air drying aluminum powder pigmented cellulose medium, and the pretreatment etch primer, which was baked for 15 to 20 minutes at 250 deg. F. The aluminum cellulose first coating medium was included because experience has shown in the past that, when a cellulose finish is essential, this is the best priming to employ to give reasonable adhesion to the finish after the normal ageing influences of hard service conditions. It performs quite well on steel, brass, tinned iron and zinc.

Table I lists the code lettering to indicate the metal, pretreatment, primer and finishing enamel, and Table II shows the test results.

As a result of the test, all the finishes lost gloss and chalked to a considerable degree. This was more marked with the cellulose enamels than with the baking varieties, and all samples were considered to have behaved well under the conditions in relation to the nature of the base metal and finishing scheme.

On the aluminum specimens, there was loss of color and gloss resulting from chalking, but the enamel film was still firmly adherent to the base metal. No other film defects developed, such as cracking, blistering or flaking. Very little corrosion was apparent in the cross-scratches.

On brass, the condition of the enam-

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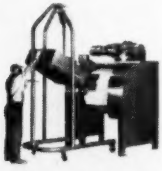

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Table II.

ASSESSMENT OF ENAMEL FINISHED PANELS AFTER CYCLE OF WEATHERING TESTS.

Sample No.	Base Material	Chemical Pre-Treatment	Primer	Finishing Enamel	PERFORMANCE AS REVEALED BY:—	
					Scratch Test.	Bend Test.
1	A	O	R	Ba.	Very brittle, chips away.	Complete flaking off.
2	A	Cr.	R	Ba.	Marked chipping.	Complete flaking off.
3	A	O	E	Ba.	Perfect.	Film strained but adhesion perfect.
4	A	Cr.	E	Ba.	Perfect.	Film strained but adhesion perfect.
5	A	Cr.	O	Ba.	Perfect.	Film strained but adhesion perfect.
6	B	O	R	Ba.	Very brittle, chips away.	Complete flaking away.
7	B	O	E		Very slight chipping.	Flaking away, not so bad as sample 6.
8	B	O	Al.	Cel.	Very brittle, chips away.	Complete flaking and powdering away.
9	B	O	E	Cel.	Perfect.	Film cracks, does not flake, but can be scraped off with thumb nail.
10	S	P	O	Ba.	Slight chipping.	Complete flaking away, no rust beneath film.
11	S	O	R	Ba.	Slight chipping.	Complete flaking away, no rust beneath film.
12	S	P	R	Ba.	Extensive chipping.	Complete flaking away, no rust beneath film.
13	S	O	E	Ba.	Perfect.	Slight straining, adhesion perfect.
14	S	P	E	Ba.	Marked chipping.	Complete flaking away, no rust beneath the film.
15	TS	O	R	Ba.	Perfect.	Very slight flaking, very good.
16	TS	O	E	Ba.	Perfect.	Perfect.
17	TS	O	Al.	Cel.	Marked chipping.	Film strained and easily scratched off.
18	TS	O	E	Cel.	Perfect.	Perfect.
19	ZS	O	O	Ba.	Very brittle, chips away.	Complete flaking off leaving zinc slightly corroded.
20	ZS	O	R	Ba.	Very brittle, chips away.	Complete flaking off leaving zinc slightly corroded.
21	ZS	P	O	Ba.	Perfect.	Film cracks and flakes along bend, remaining film easily scratched off.
22	ZS	O	E	Ba.	Perfect.	Film strained, slight flaking at end of bend, adhesion good.
23	ZS	O	Al.	Cel.	Perfect.	No cracking or flaking, but could be scraped off with thumb nail; adhesion only moderate.
24	ZS	P	O	Cel.	Slight chipping.	No cracking or flaking but powders away on scratching; adhesion only moderate.
25	ZS	O	E	Cel.	Perfect.	No cracking or flaking but could be scraped off with thumb nail; adhesion fairly good.
26	CS	O	O	Ba.	Very brittle, chips away.	Complete flaking off, leaving cadmium clean.
27	CS	O	R	Ba.	Very brittle, chips away.	Complete flaking off, leaving cadmium clean.
28	CS	P	O	Ba.	Perfect.	Film cracks and flakes along bend, remaining film easily scratched off.
29	CS	O	E	Ba.	Perfect.	Film strained but adhesion perfect.
30	CS	O	Al.	Cel.	Slight chipping.	No cracking or flaking, but film easily powdered off with thumb nail. Adhesion poor.
31	CS	O	E	Cel.	Perfect.	Perfect.

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el films was closely similar to that on aluminum.

On steel, heavy rusting occurred in the scratches but was confined to them and did not spread back beneath the finishes; otherwise, the appearance was similar to that of the aluminum specimens.

On the tin, zinc and cadmium coated steels, the condition was the same as on the brasses; namely, with more loss of gloss to the cellulose than to the baked finishes. Some corrosion of zinc and cadmium occurred along the scratches.

The serviceability of the enamel finishes (the 30 days' cyclic testing is generally deemed to be equal to 18 months continuous outside exposure with extremes of temperature and humidity) was also shown by the condition of the metal underneath the enamel coating compared with that on the reverse side of the panels. The back of the steel was very heavily rusted, including the phosphatized specimens, the zinc plate was heavily corroded and spotted with rust, the tinplate was spotted and lined with rust, the cadmium plate was appreciably corroded, the aluminum considerably whitened with corrosion product, and the brass badly stained.

The most critical assessment of the performance of these finishes under test was made by scratch and bend tests on the panels at the end of the test period. The results from this evaluation are shown in Table II, and these are briefly commented upon below under the heading of each base metal.

Aluminum. Only baked schemes were examined. Primer and finish enamel performed badly under scratch and bend conditions, this applying to both plain and chromatized aluminum. One coat of enamel straight on the chromated surface, however, was very good while the etch primer resulted in a perfect job in both cases. The pre-

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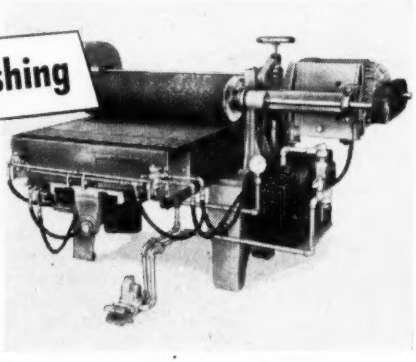

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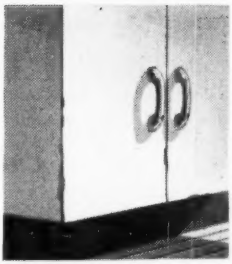

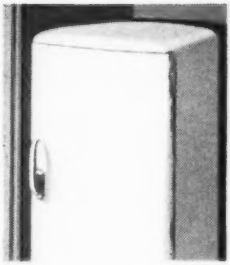

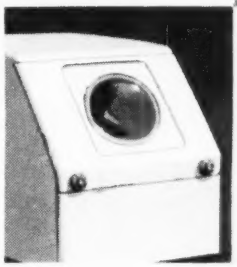

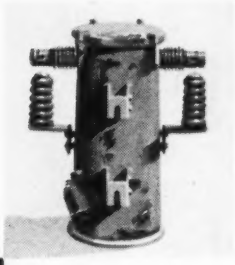

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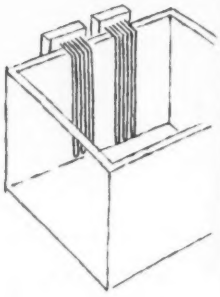

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treatment primer has outstanding merit here.

Brass. This is perhaps the most difficult metal to finish. The etch primer did not give perfect results, but showed substantial superiority over the oxide primer in the baking scheme, and over the aluminum powder primer in the air drying cellulose finish. It therefore possesses advantages for brass.

Steel. The etch primer and baked enamel showed superiority when compared with phosphatizing and enamel, red oxide primer and enamel, or phosphatizing, red oxide and enamel. Etch priming on the phosphated surface was not very good.

The etch primer applied to clean steel thus showed better performance than phosphatizing or red oxide primer, or a combination of the two, as a basis for subsequent baked enamel.

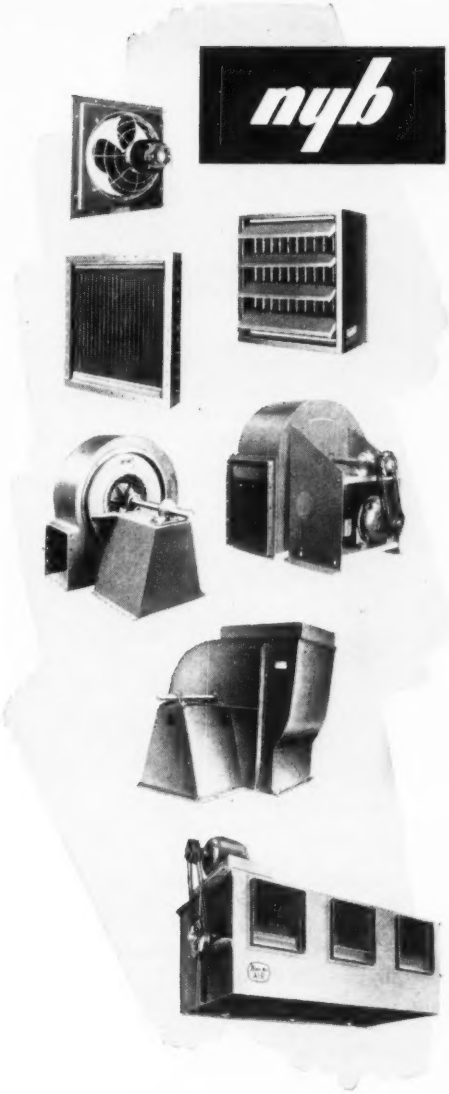
Tinned Steel. On the tinned surface, red oxide primer showed up very favorably as the base for baked enamel, but etch primer was better. For cellulose, the etch primer was superior to the aluminum powder primer. The etch primer is thus outstandingly good in this section.

Zinc coated steel. The adhesion of baking enamel on the zinc is shown to be poor, and the red oxide primer in no way assists. Phosphatizing gives some improvement but the etch primer results in an almost perfect job. With the poor cellulose finishes the etch primer assists materially.

Cadmium coated steel. Normal media do not give permanent adhesion to cadmium plating. The baked enamel direct or over red oxide primer is very poor indeed; phosphatizing is shown to assist appreciably, but the etch primer results in an almost perfect finish.

The same result is seen with cellulose enamel on cadmium, the etch primer solving a difficult problem.

From this fairly comprehensive test series, which covered quite a wide range of base metal surfaces, the pre-



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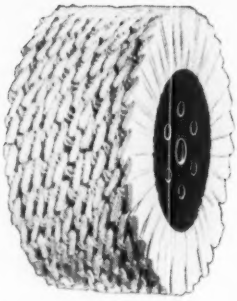

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treatment etch primer in no case failed, nor was its performance excelled by other treatment, and in fact in only one instance (baked enamel direct on chromatized aluminum) was its durability equalled. These results agree with, and confirm, those obtained under other test conditions such as hot humidity, mild humidity, salt spray and open atmospheric tests.

The versatility of the etch primers make them attractive as a sound proposition to many industries, those concerned with a single metal, those with a wide range of metals and those dealing with a miscellany of components any one of which may be an assemblage of metal types. Aluminum/steel combinations; zinc coated steel welded to plain steel; steel having brass bushings or the like; aluminum die castings having bronze or brass inserts; zinc castings with steel inserts; these are some examples upon which satisfactory enamel finishes can be produced by degreasing, etch primer and the appropriate enamel finish.

The etch primer is particularly of interest to the electrical communications industries, as they are concerned with all metals of engineernig and all metal coatings. It secures enamel adhesion to electro-zinc and cadmium coatings on steel panels, and the troubles with enamel finishes on brass hinges. Among other advantages, it makes available reliable enamel finishes on components fabricated with seams, on zinc and aluminum castings, and on soldered or brazed brass and copper assemblies.

The etch primer is not only a versatile material with respect to the metal surface to which applied, but also with regard to mode of application, the type, and the overcoating material. It makes a close approach to a universal first coating treatment of all work passed to the painting shop. Its successful establishment in industrial finishing should therefore be assured.

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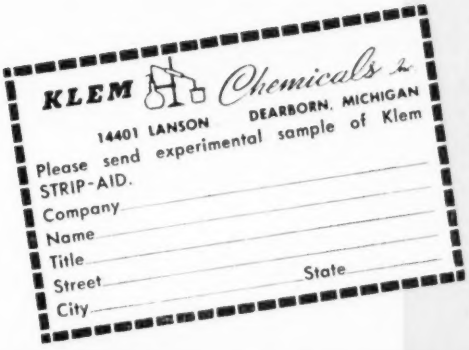

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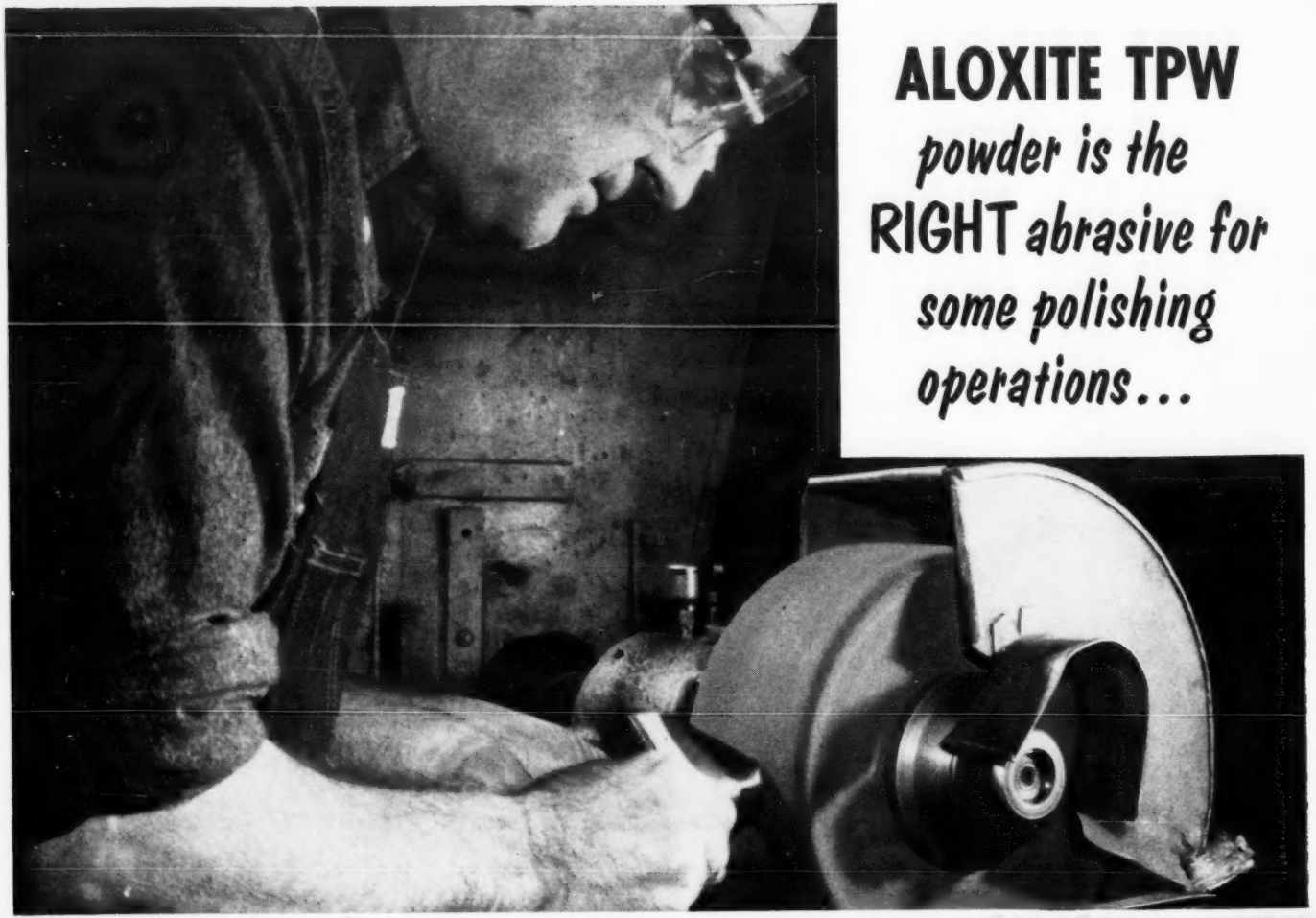

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3	**ALOXITE TPL** Aluminum Oxide	Very sharp, friable. Grits 16 through 220. (It fractures during use, thus reduces loading of the wheel surface.)	Polishing low tensile strength metals—copper, brass, bronze, aluminum.
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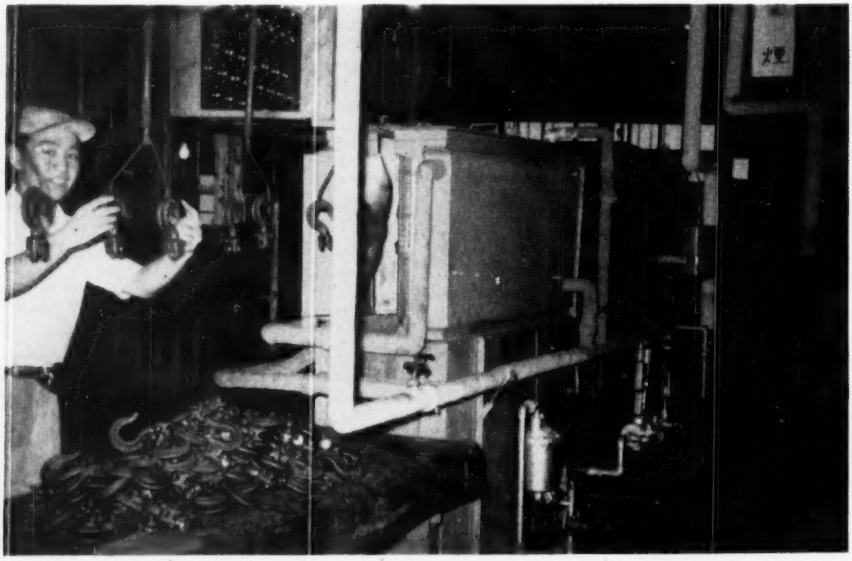
83-57

Spray Finishing

Modern metal cleaning, phosphatizing, painting, and baking methods are employed for finishing forged or stamped steel parts for chain blocks in the plant of K. K. Kito Seisakusho, located near Kawasaki, Japan. The process is described briefly in the photo story which follows.

By EZRA A. BLOUNT

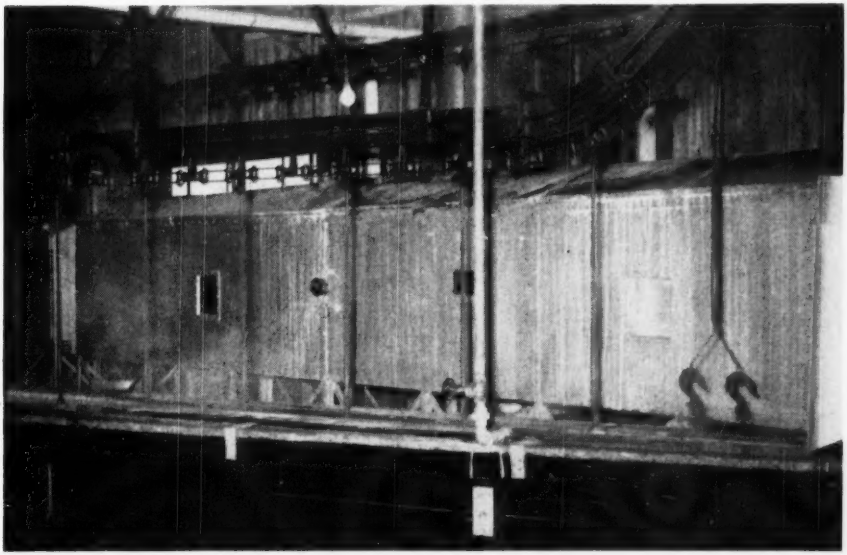
Fig. 1—Forged hooks, previously deburred by dry tumbling, are hung on an overhead chain conveyor, moving at 3 ft./min., and degreased in a trichlorethylene vapor degreaser. The chain dips to lower the hooks into the vapor after entering the degreaser housing.



Chain Blocks

Fig. 2—Cleaned steel hooks are immersed for 3 minutes in 7 per cent phosphoric acid held at 122 deg. F. (wood, lead-lined tank shown in foreground of photo). Located directly behind the phosphoric acid tank is a tunnel-type spray phosphatizing machine built by Japan Parkerizing Company. Pickled parts, such as the two pickled hooks shown in this photo, enter the tunnel and pass through the following treatments:

1. Cold water spray rinse at 10 p.s.i. for 3 minutes.
2. Spray Bonderite (10 p.s.i.) at 165 to 190 deg. F. for 3 minutes.
3. Hot water rinse for 1 minute.
4. Spray with 0.05 per cent chromic acid at 140 to 155 deg. F. for 2 minutes.
5. Dry in infra-red oven for 2 minutes.



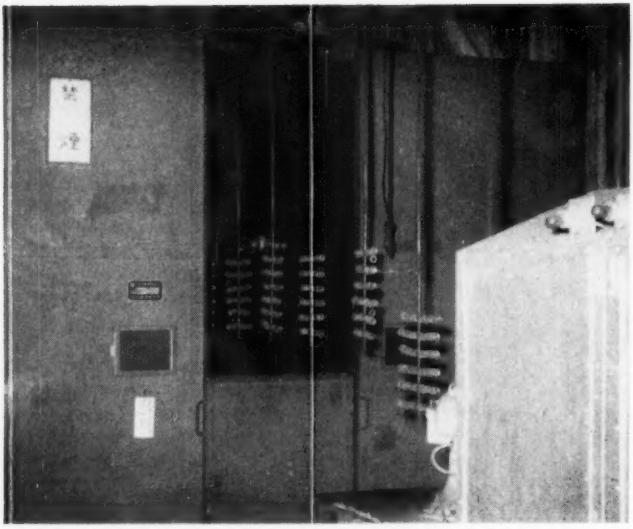
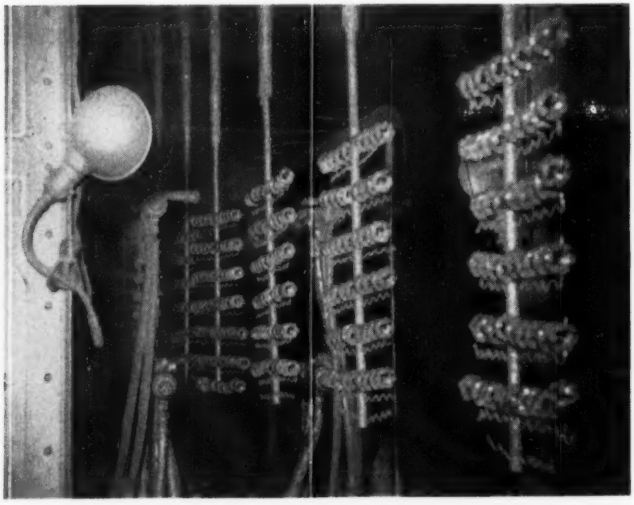


Fig. 3 — Phosphatized, dried lock nuts leave the infra-red oven and enter the 12 by 18-foot electrostatic paint spray booth. (The sign on the spray booth means "No Smoking".)

Fig. 4—Four Binks spray guns apply green melamine enamel automatically as the lock nuts pass between the charged grids in the Ransburg electrostatic spray booth. Grid voltage is maintained at 90,000 to 92,000 volts. Atomizing air pressure is 8 to 10 p.s.i., and paint fluid pressure is 5 p.s.i. Racks of parts are hooked on the conveyor hangers by means of matching notches in the rack and the conveyor hanger. A steel tube then slips down over the junction, locking the rack on the hanger, and at the same time serving as a shield to prevent paint from destroying the electrical contact between the conveyor hanger and the parts rack.



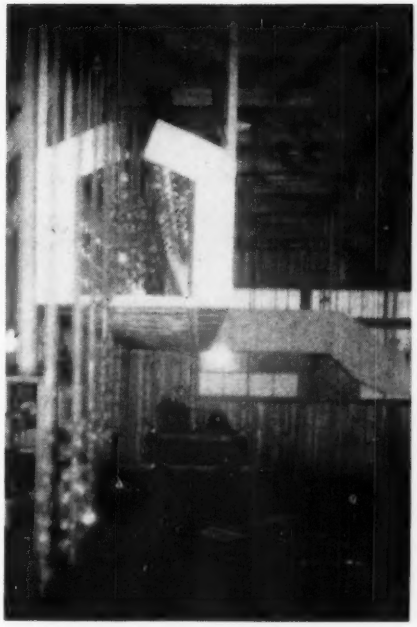
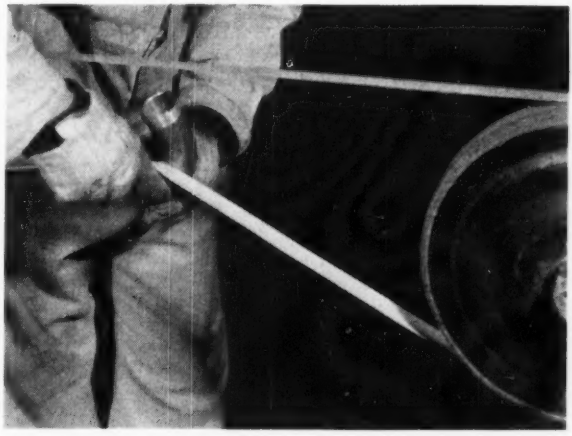


Fig. 5—Sprayed parts "set up" for 4 minutes in the open air, and then for 6 minutes in a warm infra-red oven section, shown in the background of this photo. Final baking is accomplished in a 45-foot oven, shown at the left. By means of a control panel, the temperature on each 6-foot section of the oven can be adjusted and controlled so that the desired temperature gradient can be obtained. Baking is done at 250 deg. F. The conveyor carries baked parts from the overhead infra-red oven down to floor level where they can be removed from the conveyor by the same operator who performs the loading operation.

(*PRODUCTS FINISHING Staff photos*)

Abrasive belts which are subjected to excessive loads may be strengthened quickly and inexpensively with a backing of pressure-sensitive, fiberglas-reinforced strapping tape. An investigation by the product engineering department of Behr-Manning Corp. at Troy, N. Y., indicates that this simple modification may often permit the use of these belts for fast removal of metal and in finishing operations formerly considered too severe for equipment of this type.



Reinforcement is accomplished by lining the cloth side of the belt with a lamination of the pressure-sensitive tape. A simple arrangement of pulleys can be set up to expedite the job, Behr-Manning engineers report.

In addition to increasing the tensile strength of the backing of the belts, this tape reinforces the belt joint and increases the crosswise rigidity of narrow belts, thus eliminating edge bowing and twisting.

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To the American home-owner—sworn enemy of the sticking door and dauntless foe of dripping faucets—no right is more jealously guarded than that of browsing through the neighborhood hardware store on Saturday morning. Most of the time he is "just looking," but his every purchase of a tool or fixture is guided by an accurate eye for quality. To the home-owner, as well as the dealer, this invariably means good functional design and eye appeal, plus the protection against rust and wear imparted by modern plating processes.

Hardware manufacturers, too, know that their products' visual appeal, utility, and durability can be increased through the use of modern plating processes. And in utilizing these precision finishing methods, they have habitually turned to Hanson-Van Winkle-Munning for sound technical advice and the best in processes, equipment and supplies.

For the hardware industry—like *all* American industry—has found a completely dependable source of assistance, equipment, and supplies for all plating, anodizing, pickling, polishing, and buffing operations. That source is H-VW-M and *Platemanship*.

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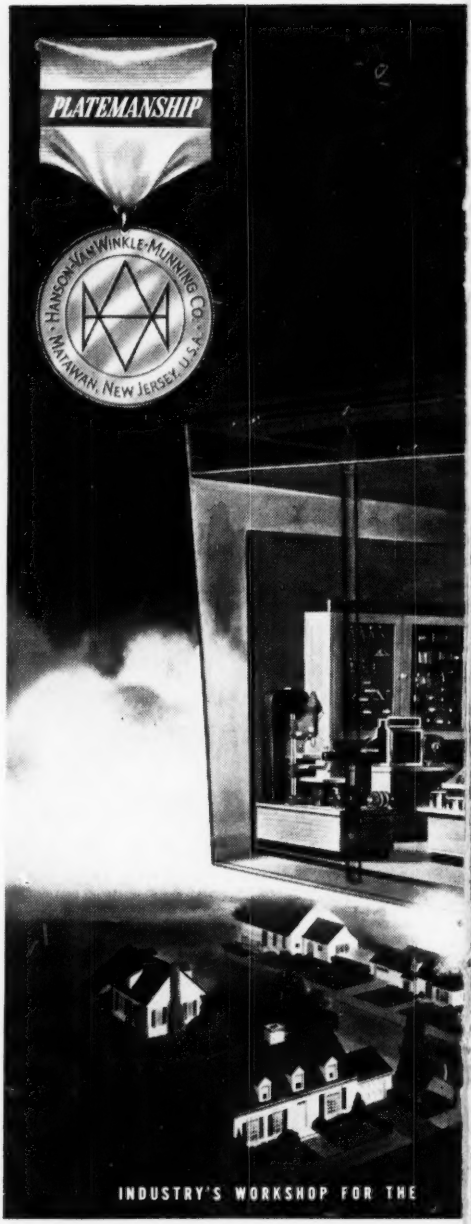

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Spotlighting FINISHING Progress

Abrasive Tumbling Offers Finishing Economies

By DR. ALLEN G. GRAY

AN increasingly popular method of deburring and surface finishing many types of metal parts is by abrasive tumbling, often referred to as barrel finishing. This low cost finishing process deburrs, removes scale, tool marks and flash, improves surface finish, and forms radii to blueprint specifications. Recent developments have resulted in improved equipment and materials which make it possible to barrel work many parts previously considered impractical.

At the General Electric Company's West Lynn Meter and Instrument Works, barrel working of many small parts for precision products is a major operation. According to Charles O. Furbish, who recently discussed possibilities of the process in the "General Electric Review," more than 900 different parts are now being barrel processed at the West Lynn Works and the requests for tumbling far exceed the development capacity. Mr. Furbish received General Electric's Charles A. Coffin Award for his work in the development of tumbling as an economical and scientifically controlled manufacturing process.

All barrel finishing operations are related, according to Mr. Furbish. Results from the various operations differ only in the amount of material removed from the part and the type of finish obtained, the results being determined to

A Monthly Digest of Current Technical Progress Indicating Significant Trends and Developments in the Finishing Industry

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a large extent by the barrel and media used. Media is the term used to describe the material in the barrel other than the parts being processed. Barrel working operations practiced at this G-E plant were classified as rough tumbling, rolling, or burnishing. These are illustrated in Fig. 1.

Rough tumbling, usually applied to castings, is comparable to snagging or rough grinding. In this process the work is packed in a nearly filled barrel so that the parts do not shift appreciably. The barrel rotates horizontally and causes the media to roll over and around the load. This chips off the scale, sprues, and fins, and smooths the protrusions. The media and abrasives are in the dry form, although wet tumbling is not uncommon.

Rolling

This is comparable to the more finished forms of grinding and polishing and is the most widely applied at this G-E plant. The parts, media and compounds are in continuous motion, shifting with the mass. The barrel is generally half filled. The action takes place when the revolving barrel lifts the mass to a point where the mass slides in the direction in which the barrel is turning, thus creating the working action in the load. Results depend a great deal on the shape and size of the barrel, its speed and its angle. These factors are selected according to the shape, size, material, and the quantity of parts being processed. Figure 2 illustrates tumbling action obtained in an octagonal barrel.

In improper barrel loads the parts separate from the mass, pound around on each other and cause nicking, impinging, and other deformities. Improper barrel loads also require longer barrel cycles and, in some instances, will not produce the results under any circumstances. Suitable metal parts can be rolled upon themselves either wet or dry or, with an abrasive or cleaning compound to meet most requirements. Generally, however, because of shape, size, quantity, or delicacy of the part, a filler must be added to form the load mass essential to proper barrel action. This filler keeps the parts spaced and carries the action into crevices and interstices when parts with irregular surfaces are being worked.

For wet loads, fillers may be shaped

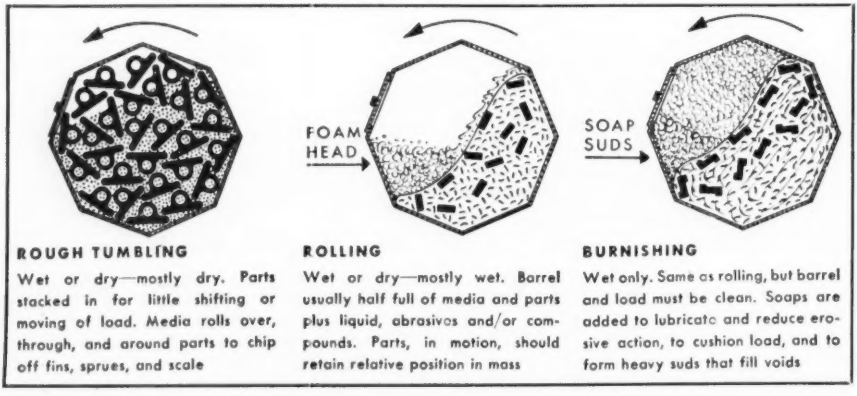
FOAM HEAD
SOAP SUDS
ROUGH TUMBLING
Wet or dry—mostly dry. Parts stacked in for little shifting or moving of load. Media rolls over, through, and around parts to chip off fins, sprues, and scale
ROLLING
Wet or dry—mostly wet. Barrel usually half full of media and parts plus liquid, abrasives and/or compounds. Parts, in motion, should retain relative position in mass
BURNISHING
Wet only. Same as rolling, but barrel and load must be clean. Soaps are added to lubricate and reduce erosive action, to cushion load, and to form heavy suds that fill voids

Fig. 1—Three Basic Barrel Operations
(Illustration courtesy The General Electric Review)

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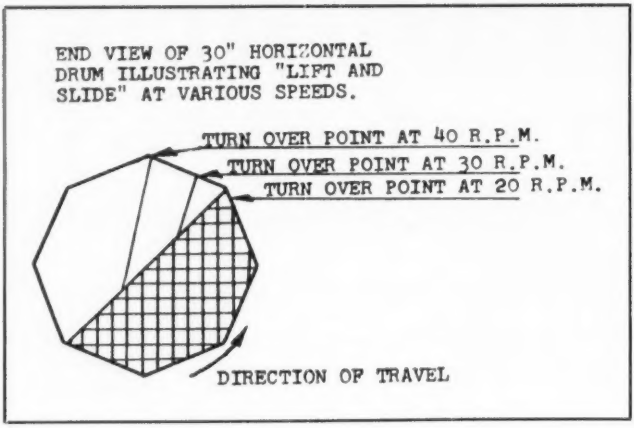
END VIEW OF 30" HORIZONTAL
DRUM ILLUSTRATING "LIFT AND
SLIDE" AT VARIOUS SPEEDS.
TURN OVER POINT AT 40 R.P.M.
TURN OVER POINT AT 30 R.P.M.
TURN OVER POINT AT 20 R.P.M.
DIRECTION OF TRAVEL

Fig. 2—Tumbling action obtained in an octagonal barrel with points designated to illustrate lift and slide at various operating speeds.

(Illustration courtesy The General Electric Review)

pieces or punchings of either steel or mineral. Wood blocks, sawdust, leather, and various forms of vegetable products are used for dry loads. In both cases, fillers are selected to perform their function without damage to the work and in sizes that will not lodge in blind holes and cutouts. Abrasives, both natural and manufactured, as well as cleaning, descaling, coloring, and lubricating compounds, are available in a wide variety ranging from alkaline through acid. When they are used in accordance with the manufacturers' recommendations they speed the process for which they were made.

Burnishing

Barrel burnishing is capable of producing luster and finishes most nearly comparable to cloth wheel grinding and buffing. The parts are rolled in a solution of water and burnishing compound, one function of which is to lubricate and reduce the erosive action on the surfaces of the parts. This results in lustrous finishes and reduced micro-inch surface roughness readings. Adding hardened steel to this mixture increases the weight factor, making possible a degree of surface hardness that is desirable for durability and antifriction. The weight also tends to close pores.

One point emphasized by Mr. Furbish was that cleanliness and careful preparation are of paramount importance if burnishing results are to be satisfactory. Burrs, sharp edges, abrasives, oils and other foreign matter that could cause scratching and contamination should be eliminated. The

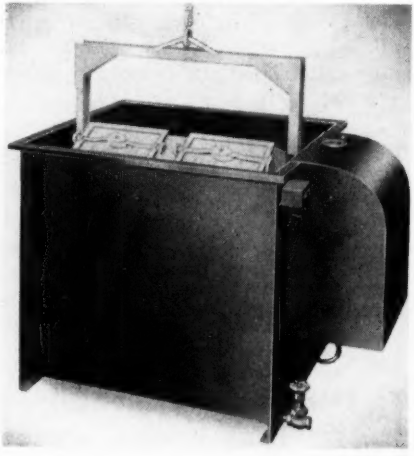

Fig. 3—Almco Supersheen submerged barrel finishing machine.

(Photo courtesy Almco Div. of Queen Stove Works, Albert Lea, Minnesota)

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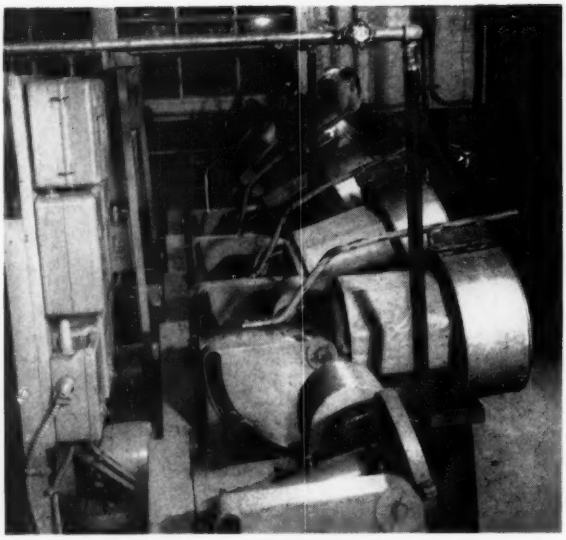

Fig. 4—Small barrels designed for flexibility in tumbling parts
(Photo courtesy The General Electric Review)

entire process must be one of thorough cleanliness. Work to be burnished is usually prepared by the rolling process, then thoroughly cleaned before burnishing.

Submerged Barrel Finishing

Possibly the newest adaptation of one of the fundamentals of barrel finishing is now being applied in the process known as submerged barrel finishing. The work and filler are contained in a perforated cylinder that revolves in an open tank of liquid containing abrasive, cleaning, or burnishing compounds. This technique is proving useful in the processing of heavy parts and large soft-metal parts. The cushioning effect, resulting from the complete submersion of the cylinder, lessens the impact to such an extent that nicking and scratching are kept to a minimum.

Figure 3 shows a submerged barrel unit. The drum is loaded with work parts and the abrasive chips or metal shapes. Various liquid compounds are used in the tank depending on whether the operator is to burnish, polish, clean, descale, or rustproof. This model is for use alone or "in-line" for multiple operation processing. For instance, an in-line installation consisting of six tanks would include a combination cleaning and deburring operation, rinse, descale and deburr at one time, rinse, burnish, hot rinse, or a rustproofing treatment. In such an arrangement, the drum is loaded with parts and abrasive chips and moved from one location to another, eliminating the need for removal of the mass from the drum until the process is completely finished.

A balanced assortment of larger units are also used in the tumbling department. Figure 4 shows a group of small tumbling barrels designed for flexibility in tumbling activity.

Developing a Tumbling Procedure

In the Meter and Instrument Department at the General Electric Company's West Lynn Works, barrel-working of many small parts for precision products is a major operation. In these operations there is no definite formula whereby it is possible to predetermine the factors that make up the original process of tumbling for a particular part. Each new job is considered in the light of past experience and trial runs are made to determine the proper procedure. All new work and changes are routed through Tumbling Methods Section where the process is developed

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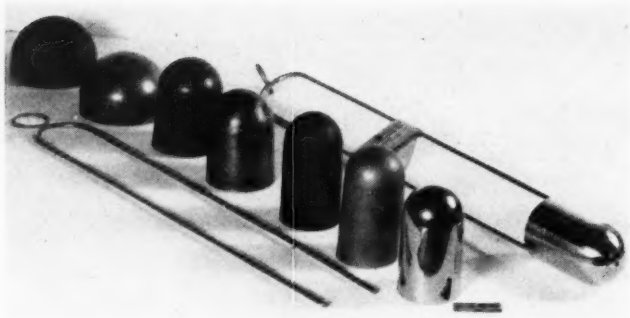


Fig. 5 — Viscosimeter cups are tumbled to remove scale after three stages of drawing and annealing and are finished by tumble burnishing; stainless steel bail and ring are also finished and burnished by tumbling.

(Photo courtesy The General Electric Review)

and recorded.

To develop a process intelligently, certain preliminary information is essential. To aid this procedure, planning, engineering, and manufacturing sections are furnished "request for tumbling" cards, on which this information is recorded when the request is submitted. A problem number is assigned each card, and the number becomes the permanent reference and identification for that particular part. Once the process is developed, "tumbling process" cards are prepared and distributed. They contain the problem number and the information necessary to set up and process successive lots of parts.

G-E Applications

Vital parts used in apparatus are given a tumble finish to eliminate stickiness and erratic operation of the instrument. In developing the preferred procedure for these parts, sample parts were barrel rolled to form a radius, cleaned, and then ball burnished to a smoothness and luster suitable for plating. After plating, the parts were again ball burnished, (see Fig. 5).

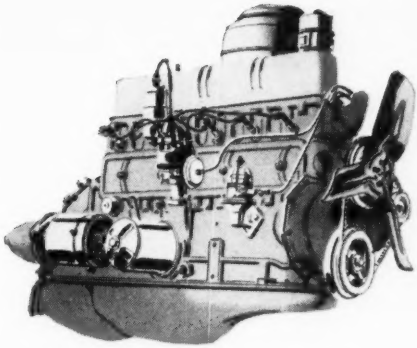
This operation restored the luster, smoothed the plated coating to a slick finish, and closed the pores, thereby increasing life. Parts are now barrel processed with 100 per cent acceptance.

Barrel Finishing with Aluminum Oxide Tumbling Abrasive

Before starting a production run on barrel finishing, Norton Company recommends that the operating procedure be established based on the determination of the following factors: abrasive grain size; length of tumbling time; barrel speed; type of cleaner. Coarser abrasive grains cut faster and produce larger radii. Therefore, the coarsest size commensurate with the radii called for should be used, keeping in mind that the grains must not be of such size as to wedge in the work openings.

For the first trial run in determining the roughening operating procedure, the barrel should be loaded as follows:

1. Fill the barrel with "Alundum" tumbling abrasive level with the top of the center shaft of the barrel.
2. Add water until the water level is approximately 3 inches below the level of the abrasive.
3. Add workpieces until the barrel is ⅝ to ¾ full. If there are not enough workpieces available, substitute abrasive for work pieces by volume to bring the barrel load to the desired level.
4. Add cleaner selected for the roughing operation. (Ratio—2 to



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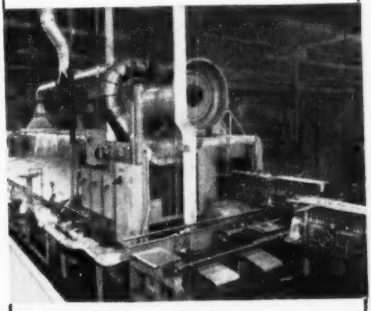

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8 oz. maximum for each 30 by 30-inch compartment.)

The barrel is now ready to run to determine the time cycle required. If the barrel is equipped with a variable-speed drive, it should be run between 5 and 20 r.p.m. for most rough barrel-grinding operations. Extra heavy or critical burrs should be removed at lower speeds. After about one hour, such burrs will have been sufficiently ground off to permit increasing the speed for the rest of the roughing operation. This will cut down the time required.

The slow speed is employed during the first hour to avoid peening over the large burrs. Parts which are subject to distortion should also be tumbled at the lower speeds. Higher speeds are used where the burrs are slight or where the removal of scale is the only operation desired. Scale will also be removed almost as efficiently at lower speeds, if heavy burr removal is to be accomplished at the same time.

At the end of one hour, the work should be inspected. This may be enough time for some operations, but usually more time is required. Thereafter, the work should be inspected approximately every 30 to 60 minutes until the desired results have been obtained. The time required to establish these results becomes a standard time for the operation. On succeeding trial runs, the quantity of work added to the barrel should be increased by one tote pan and the abrasive decreased by the same amount. In each case the load should be tumbled for the standard time. These changes in loading should be carried on until the standard time no longer is sufficient to produce the desired results, or until the work pieces show evidence of nicking each other. The maximum amount of parts determined in this manner then becomes the maximum work load for the operation.

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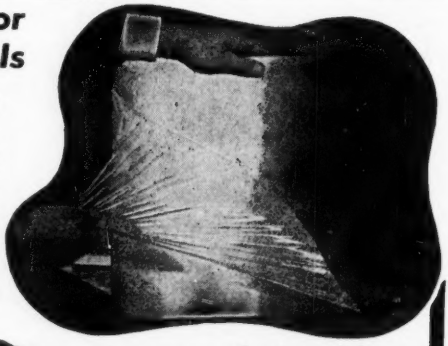

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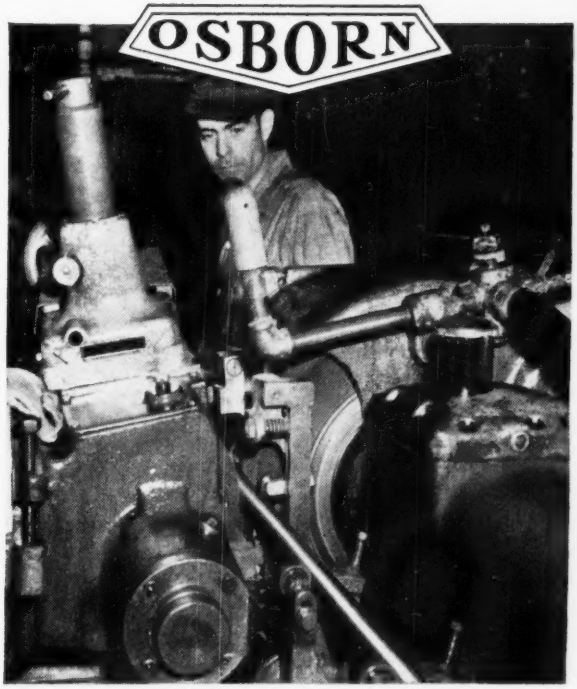
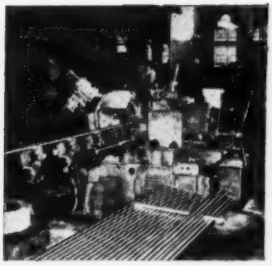
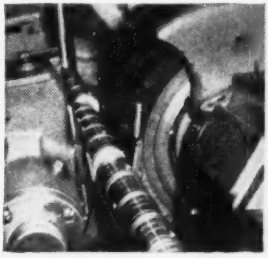




THE SET-UP. This shows the centerless grinding machine which also serves as a "centerless brusher". These pump rods vary from 1¼ in. to 1½ in. diameter . . . from 6 ft. to 36 ft. in length. Regulating wheel speed is 52 r.p.m.



ANOTHER JOB. Here Centerless Brushing finishes cast iron pistons to micro-smoothness. Simplifies assembly operations and increases life of pistons and cylinders. Output of this machine is 10,000 pieces per 8 hours.

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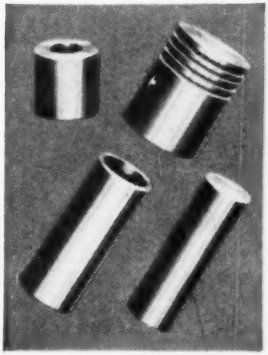

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Finishing

The essential difference between the roughing and finishing operations is that in the latter, cleaners (chemicals or compounds) are added to cause the abrasive to burnish rather than "grind" the work. In some cases, it may be desirable to use a finer abrasive for finishing than was used in the first operation, the same grain can probably be used for both operations. This is best determined by trial. Outlined below are the general steps to be followed in the finishing operation:

1. Rinse the load thoroughly. A hose with hot or cold water should be sufficient to remove roughing operation chemicals and grinding residue.
2. Add sufficient water to cover the load 5 to 10 inches above the mass.
3. To improve the color, add a suitable cleaner in the ratio of 1 to 1½ pounds of cleaner to each 30 by 30-inch compartment.
4. Rotate the barrel 15 to 60 minutes or more to meet the finish specifications.
5. Unload, wash, oil dip or dry immediately.

In many cases, according to the Norton Company's tests, the quality of the finish improves with increased barrel speed. Conventional barrels may be run as high as 35 r.p.m. and the submerged type may be run up to 70 r.p.m. for a low micro-inch finish. In cases where the abrasive sizes are changed for the finishing operation, the same amount of abrasive by volume should be used as for roughing. In some cases, the finishing operation can be started in a similar manner to the roughing operation; that is, with low water level and cutting cleaner, after which the load is rinsed and the finishing operation performed essentially as outlined above. This procedure is said to produce the equivalent of a "finish grind." Figure 6 shows a variety of parts fin-

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ished by precision tumbling with Norton medium tumbling abrasive.

Oily parts should be washed before tumbling, since the oil tends to retard the abrasive action and also produces unfavorable working conditions by coating the inside of the barrel with oil and saturating the abrasive with oil. It is generally agreed that good color of tumbled parts can never be obtained under these conditions. Ferrous parts should be washed in a non-oily, rust preventive solution to prevent rusting prior to the tumbling operation. After the barrel finishing operation, the parts should be immediately and thoroughly washed. Here again, it is desirable to use a rust preventive solution with ferrous parts.

According to Norton, small lots of different parts can be mixed in the barrel finishing operation if the following requirements are met:

1. If they can be tumbled with the same size of abrasive.
2. Parts should be of approximately the same weight.
3. They should be made of the same metal or alloy.
4. Finish requirements for all parts must be the same.
5. If they can be tumbled with the same cleaners.

When parts of different weights are tumbled together, nicking will almost always result.

Zinc Die Casting

The zinc die casting shown before and after barrel finishing in Fig. 7 was processed according to the following scheme. In this case flash removal and deburring was achieved, followed by a treatment to give a bright finish.

Barrel — Horizontal, octagonal type, lined. Size of each compartment: 30-inch diameter; 28 inches long.

Abrasive — Alundum tumbling abrasive, size No. O-T for roughing; No. 8-T for finishing. Amount: 800

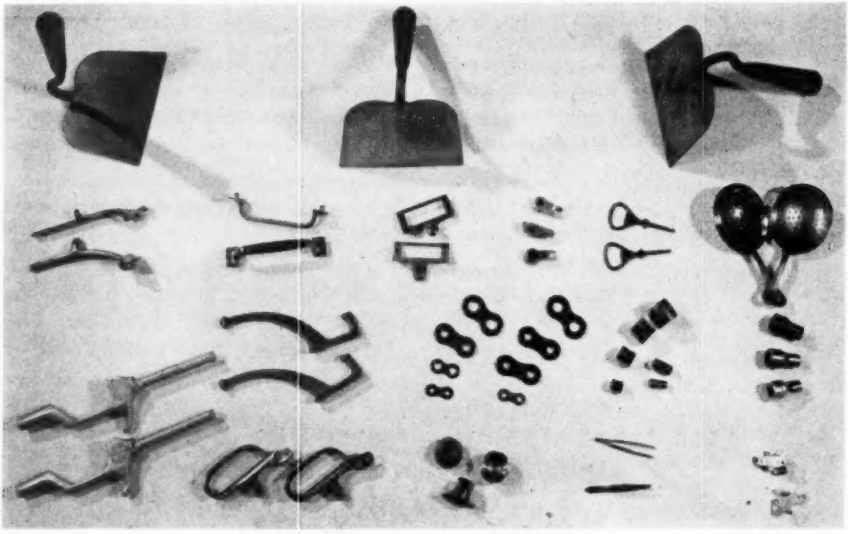
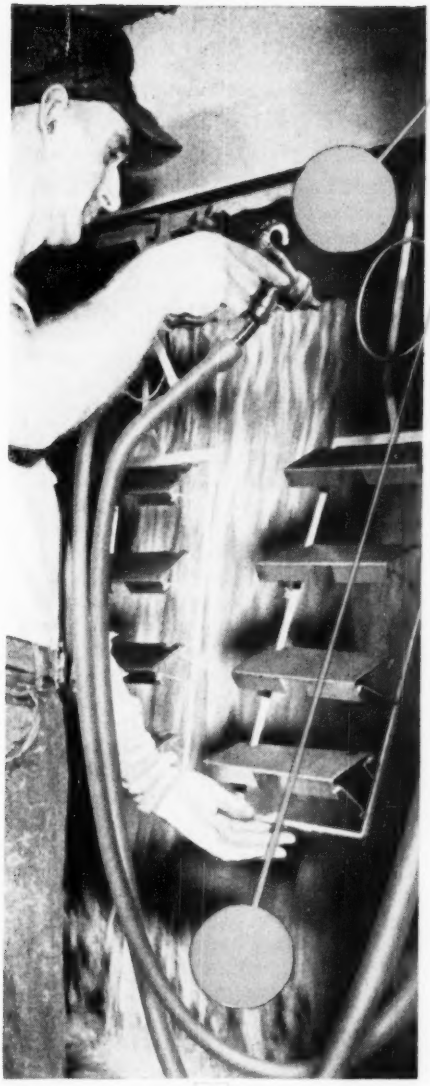


Fig. 6—Parts finished by Aluminum Oxide ("Alundum") abrasive tumbling. *(Photo courtesy Norton Company, Worcester, Mass.)*



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A Better Start for Your Finish

pounds of each size per compartment.

Water — For roughing, add water until level is approximately 3 inches below the level of the charge; for finishing, add until water level is approximately 10 inches above the level of the charge.

Cleaners — For roughing, add ½ pound suitable type; for finishing, add 2 pounds suitable type.

Barrel Speeds—For roughing, 25 r.p.m. for 5 hours; for finishing, 15 r.p.m. for ¼-hour.

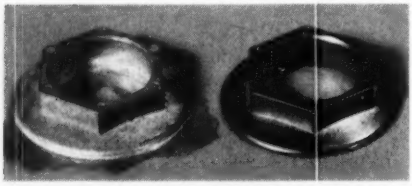

Fig. 7—Zinc die cast parts before and after abrasive tumbling.
(Photo courtesy Norton Company, Worcester, Mass.)

Steel Stampings

The following procedure has been used on steel stampings to deburr, form radii to blend, and give a bright color finish.

Barrel — Horizontal, octagonal type, lined. Size of each compartment: 30-inch diameter; 28 inches long.

Abrasive — Alundum tumbling abrasive, size No. 0-T for roughing; No. 4-T for finishing. Amount: 800 pounds of each size per compartment.

Water — For roughing, add water until water level is approximately 3 inches below the level of the charge; for finishing, add until water level is approximately 10 inches above the level of the charge.

Cleaners — For roughing, add ½ pound of suitable cutting type cleaner; for finishing, 1½ pounds of suitable finishing type cleaner.

Barrel Speeds—For roughing, 20 r.p.m. for 6 hours; for finishing, 15 r.p.m. for 1 hour.

Sliding Action In Barrel Important

Tests have been conducted by Almco Division of Queen Stove Works to show that the basic action of barrel finishing consists of a rotary movement of the mass of media and parts to the point where the effect of gravity overcomes the tendency of the mass to stick together so that the upper layer of the work slides, not falls, toward the lower portion of the barrel. Roughly 90 per cent of the grinding, polishing, or burnishing is accomplished during this slide. Very little is accomplished while the parts are moving up through the mass from the bottom of the barrel to the point where they start to slide in the direction the barrel is turning.

This layer of sliding parts and material varies in thickness with the size of the barrel and the operating conditions, especially speed. When a standard barrel of 30-inch inside diameter is operating at 20 r.p.m. the layer of sliding material is described as approximately 3 inches thick. Exposed parts immediately under this layer are also subject to the finishing action. Assuming that the action takes place during the slide down across the top of the mass, the greatest effect would then occur when the top of the work load is at the greatest diameter of the barrel or half full. Loading the drum less than half full, as compared to half full, reduces the action. Certain types of small loads or low-load heights often have a tendency to ride with the barrel so that there is very little turning over of the mass and therefore very little grinding action.

According to Almco, a barrel 65 per cent full can often be made to produce as much as a barrel 50 per cent full simply by rotating at a faster speed. If the speed were the same with the

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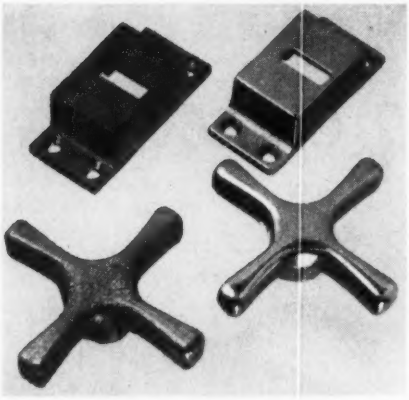

Fig. 8—Before and after appearance of parts barrel finished by the Almco "Supersheen" process.
(Photo courtesy Almco Div. of Queen Stove Works, Albert Lea, Minnesota)

65 per cent load as with the 50 per cent load, less work would be accomplished with the 65 per cent load. There is a definite limit, however, in what can be done in a small diameter machine as compared to a large one. A 12 or 16-inch diameter machine, for instance, can never be made to produce as much work as a 30-inch diameter machine, even if the smaller machine is rotated at the same surface speed. This is reported to be due to the greater force which accumulates during the latter half of the longer slide and cannot be compensated for by rotating the smaller drum at a faster rate. Figure 8 shows before and after appearance of barrel finished parts.

Effect Of Weight

An interesting test was carried out by Almco to show the effect of weight or load heights on barrel finishing. The results are shown on the graph in Fig. 9. The standard 30-inch diameter barrel was loaded to the various percentages shown and processed for a period of four hours at 20 r.p.m. Six test pieces were used in each load. The test pieces were all unhardened steel and had been ground to a sharp corner. All pieces were measured on the four edges after processing to get the radius and these measurements were averaged to get the readings on the graph.

Two additional tests were run to further show the weight factor. Both of these runs were carried out with the barrel 55 per cent full. The first test was with abrasive chips and test parts only. The second test had an additional 150 pounds of steel washers to provide extra weight. The average ra-

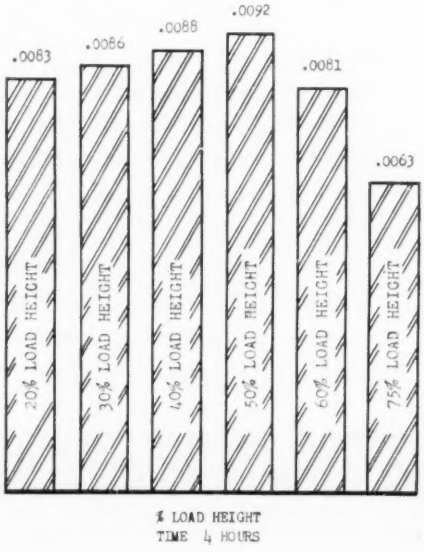

Fig. 9—Results of tests conducted by Almco Div. of Queen Stove Works to show effect of weight or load heights on barrel finishing. Test pieces were ground to sharp corner. Values shown are the final radius obtained for each test.

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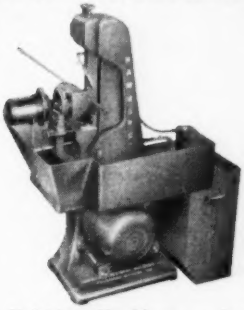

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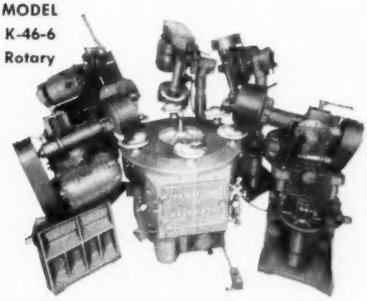
MODEL K-46-6 Rotary



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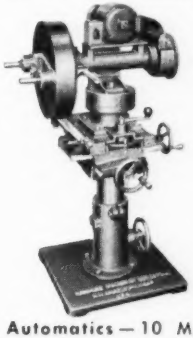

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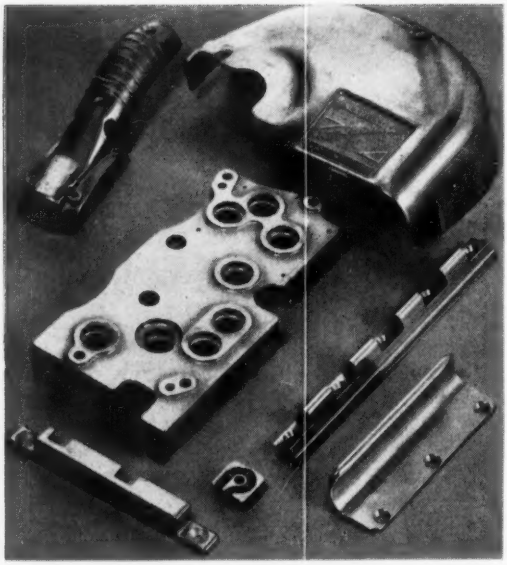

Fig. 10—Aluminum die castings that have been "Roto-Finished"
(Photo courtesy Roto-Finish Company, Kalamazoo, Mich.)

dius measurements obtained after tumbling were as follows:

Test 1—0.0078 using abrasives and test pieces only.

Test 2—0.0079 using abrasives and 150 pounds weight plus test pieces.

As the results show, there is little practical difference due to weight only, even under ideal conditions. The slight difference here, according to Almco's interpretation may be due to localized weight increases of individual washers.

Wet Tumbling With Chips

In the Roto-Finish tumbling process parts are gently cascaded while remaining submerged in specially formulated mixtures of mineral chips and chemical compounds. Six basic processes are available: grinding, deburring, descaling, polishing, Britehoning and coloring. These operations may be used individually or collectively to produce a variety of finishes on many different types of parts.

Grinding is the operation used for

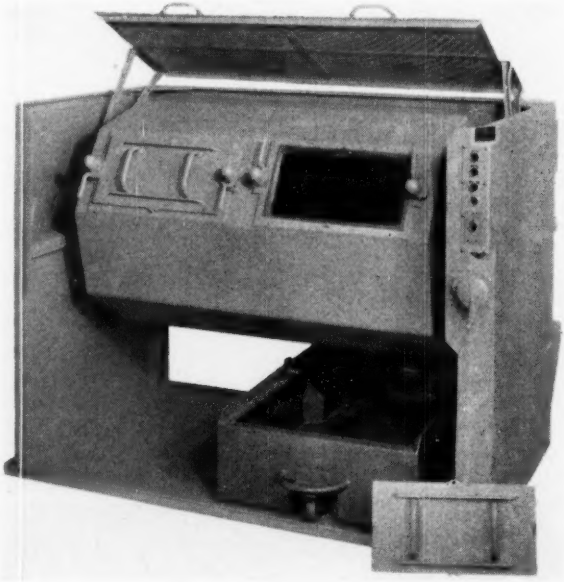

Fig. 11—A Roto-Finish barrel particularly suited for handling high production requirements.
(Photo courtesy Roto-Finish Company, Kalamazoo, Mich.)

guard against Rejects

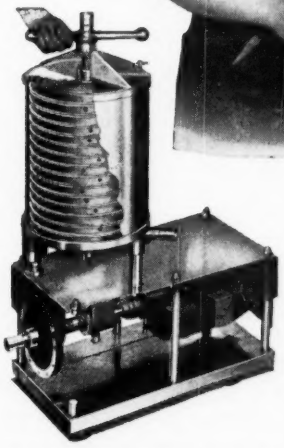

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Table I.

RECOMMENDED CAPACITY AND WORK LOAD IN POUNDS
ROTO-FINISH BARREL—COMPARTMENT SIZE 30⅛" x 35¼"—
COMPARTMENT CAPACITY 18 CU. FT.

Compartment Chip Mass in Lb.	Compartment Work Load in Pounds			
	Grinding		Britehoning	
	Steel, Brass, Zinc	Aluminum, Light Alloys	Steel, Brass, Zinc	Aluminum, Light Alloys
1000	200	120	150	90

cutting down sand castings and removing excessive metal or deep surface irregularities. The deburring operation is used to remove burrs, sharp edges, produce radii, and to remove machine marks from all types of machined, cast or stamped parts. Descaling is used to remove heat treating and forging scale from iron and steel parts. It is also useful in removing rust and corrosion from many different metals. For polishing, the process is similar to a mild grinding or deburring operation but makes use of different combinations of chips and compounds. Britehoning is a special process developed by Roto-Finish to produce a semi-lustrous finish. It is reported to be especially useful in preplating operations on such items as zinc base die castings as well as brass and steel stampings. A coloring process is available for a higher luster finish. Figure 10 shows alumnium die castings that have been Roto-Finished.

A Roto-Finish barrel particularly suited for handling high production requirements is shown in Fig. 11. It will efficiently finish large quantities of parts which may require long processing cycles. It has been particularly recommended for processing large work loads of zinc base die castings. The large door openings permit processing of larger parts and facilitate loading and unloading of chips and parts. The recommended capacity and work load are summarized in Table 1.

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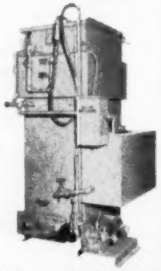

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PRACTICAL APPLICATIONS of Modern Products

Eight Ways to Get the Most From Hot Spray

By H. G. BECK

Technical Director
Industrial Finishes Department
Atlas Powder Company

CONTROLLED Temperature Application (CTA), the process of applying preheated finishing materials, has rapidly advanced from a spray-room innovation to an economic necessity. Users of organic finishes should investigate it thoroughly because of its numerous advantages. In this process heat, instead of volatile thinners, is used to lower the viscosity. Controlled Temperature Application or "Hot Spray" should always be evaluated on a production basis. The "casual" test should be avoided because it does not permit sufficient opportunity to make changes in initial solids, viscosity, air pressure and other variable factors. Adjustments are a part of testing new methods in the finishing room. The many benefits will repay the diligence and patience exercised in adapting "Hot Spray" to your individual requirements.

The best results are obtained from "Hot Spray" when the paint or finish used has been especially formulated for "Hot Spray". Some advantages may be obtained by preheating an ordinary "cold" paint but the most complete exploitation of "Hot Spray" will only be achieved by finishes formulated especially for application by this method.

The user is not dependent upon weather conditions for good results when

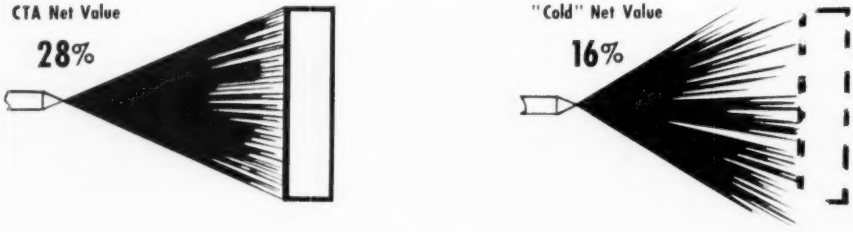

Figure 1.
CLEAR FINISHES

	CTA At Gun	COLD At Gun
Solvent portion per gallon	70 per cent	80 per cent
Solids portion per gallon	30 per cent	20 per cent
Air pressure	40 p.s.i.	55 p.s.i.
Viscosity (No. 4 Ford Cup)	18 seconds	75 seconds
Temperature of material	160 deg. F.	variable

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AUTOMATIC POLISHING, BUFFING, GRINDING EQUIPMENT

a finish is applied by CTA.

Controlled Temperature Application reduces the loss of solvents and solids due to over-spray, evaporation and rubbing. These losses are substantial, as is graphically illustrated in Fig. 1. The data on the application of clear finishes shows that the average conventional material applied "cold" has 20 per cent solids at the nozzle. All of the solvent—80 per cent—is finally lost, plus at least 20 per cent of the net solids (20 per cent of 20 per cent solids equal 4 per cent). Summing up, a total of 84 per cent (80 plus 4) of the original contents of a gallon of finishing material is lost. Now compare these figures with Controlled Temperature Application. The original solids are 30 per cent—with a loss of 7 per cent, or 2 per cent of the total content of the gallon (7 per cent of 30 per cent equals 2.1 per cent) plus the 70 per cent solvents, or a total loss of 72 per cent.

The same analysis of the figures on pigmented material shows that the net value of a gallon of material applied by Constant Temperature Application is 45 as against 32 per cent for conventional enamels. Two drums of pigmented material are required to produce the equivalent of one drum of final finish when applied by CTA as compared with the three drums of conventional pigmented material required by "cold" application.

Here are a few tips which may help you in getting full value from Controlled Temperature Application:

1. Avoid blisters, pin holes and trapped air in the final finish by removing dust particles embedded in the pores with a heavy blast of air. Be sure that the filler or surfacer is completely dry before applying the final finish by CTA. Solvent adjustment or a change in filler or surfacer may be necessary in some cases. An increase in temperature of the "Hot Spray" may be required in other cases.
2. CTA is formulated to permit application of more solids in one coat on upright surfaces without sags. Do not "pile on" CTA formulated materials in wasteful amounts.
3. CTA produces a fuller coat, minimizes the rubbing time when rubbing is required. The best results will be obtained when extra drying time is allowed prior to rubbing CTA material.

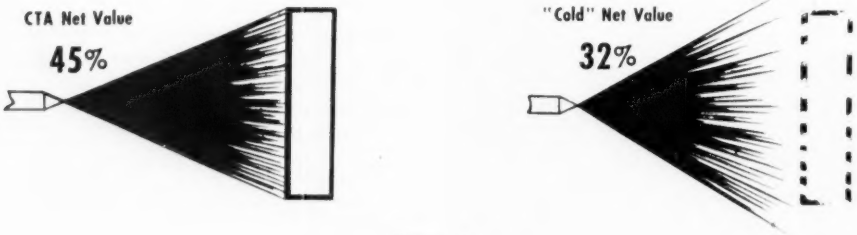

Figure 2.

PIGMENTED MATERIALS

	CTA At Gun	COLD At Gun
Solvent portion per gallon	50 per cent	60 per cent
Solids portion per gallon	50 per cent	40 per cent
Air pressure	45 p.s.i.	65 p.s.i.
Viscosity (No. 4 Ford Cup)	18 seconds	75 seconds
Temperature of material	180 deg. F.	variable

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won't
go
on...

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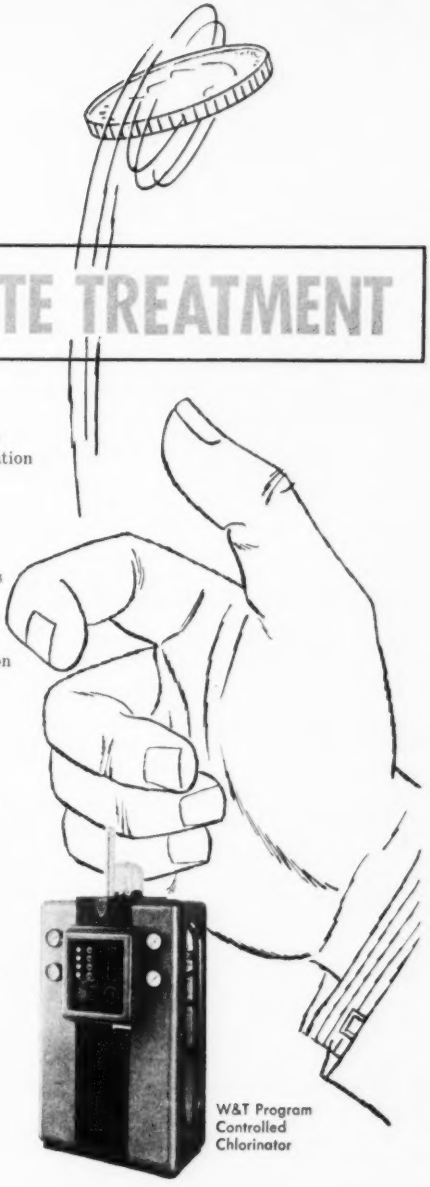
W&T AUTOMATIC CONTROL

The precision chlorinators for which Wallace & Tiernan has been known for thirty-nine years have been combined with newly developed instruments to make possible the automatic control of alkaline chlorination treatment — an assurance that cyanides are destroyed — and at minimum chemical costs.
Eliminate guess work on your cyanide waste disposal — write today for further information.



W&T Program Controlled Chlorinator

WALLACE & TIERNAN
COMPANY, INC.
CHLORINE AND CHEMICAL CONTROL EQUIPMENT
NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES

S-77

SAFETY FOR YOUR MEN...
VALUE FOR YOU
with
U.S. NEOPRENE GLOVES

They help prevent costly accidents. ● They withstand gasolines, oils, greases, and corrosive chemicals such as sulphuric, chromic, and muriatic acids, caustic and plating solutions. ● The rough-surface fingers assure positive easy gripping. ● They're comfortable because the curved finger construction conforms to the natural curve of hand, eliminates straining and pulling. Highly flexible, they permit easy, natural working motions. These "U. S." gloves withstand tough service. Full range of sizes, lengths and weights. "U. S." technical men will be glad to analyze your glove needs and recommend the correct glove for *your* job.

U. S. INDUSTRIAL GLOVES

UNITED STATES RUBBER COMPANY

4. Reduce "orange peel" by applying a wet, smooth film from a gun held at the proper distance from the work.
5. Do not use the same high air pressures normally maintained for "cold spray" application when using CTA materials. High pressures produce excessive fog and fumes which are wasteful and unpleasant to the worker.
6. Do not use CTA materials with stains, washcoat size coats, shading stains, toners and products with very low solids content because CTA offers no advantage over "cold" application with these materials.
7. When changing over from "cold" applications to CTA remember that the use of high air pressure, fast motions of the gun and holding the gun too far from the work may result in lack of bonding between coats.
8. Give the same careful attention to "Hot Spray" equipment that is given to other machinery.

The complete exhaust system of a well-known brand of motor trucks is now being given a coating of special heat-resisting porcelain enamel to eliminate the corrosive influences of hot exhaust gases and to ensure against rusting, according to the Porcelain Enamel Institute.

MASKING TAPE
DIE-CUT TO YOUR EXACT SPECIFICATIONS FROM
SCOTCH BRAND
INDIVIDUAL PIECES • ANY SIZE OR SHAPE
For quick, accurate masking operations.
PHONE OR WRITE **PANOCO**
505 Carroll St., Brooklyn 15, N. Y.

Bottoms up!
for
Stantite
STANTITE Spraying Primer has passed the tough test of a ship's bottom with colors flying. That's why many ship owners are undercoating with STANTITE to minimize corrosion and rust creep. And on land, wherever metal is coated, rust-inhibiting STANTITE also provides excellent adhesion to any metal surface, with most top coats. Ideal under air-dried or baked finishes, it dries rapidly . . . is unimpaired by any baking schedule. Find out *now* what STANTITE can do for you . . . write today: Stanley Chemical Co., 21 Berlin St., East Berlin, Conn.
STANLEY
Industrial Coatings
STANLEY CHEMICAL
LACQUERS SYNTHETICS JAPANS ENAMELS

NEWS of the Industry

NEW PLANTS

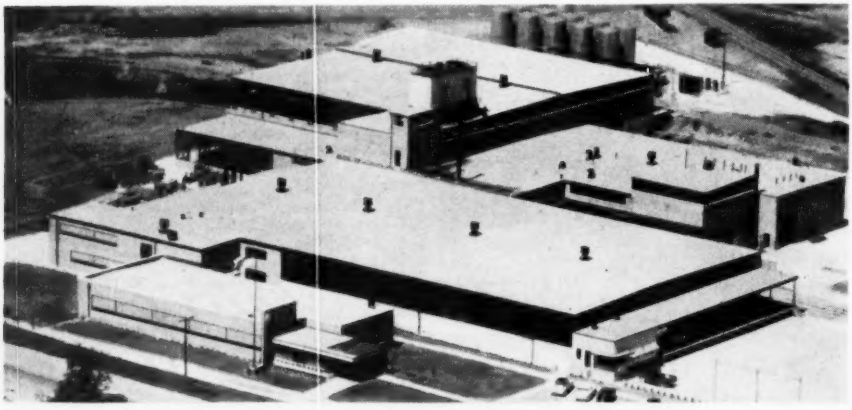
One of the largest paint manufacturing plants in the Southeastern United States was formally opened by the **PITTSBURGH PLATE GLASS COMPANY.** Designed for rapid flow production of a complete line of varnishes, enamels, resins, industrial and specialty finishes, the plant is the third ultra-modern paint producing unit to be put into operation by Pittsburgh Plate in recent years.

The new Pittsburgh unit is essentially a single story, fireproof structure, originally rated to produce 1,500,000 gallons annually. The 130,000 square foot plant and office building is uniquely designed to provide several functional levels to speed gravity flow requirements in manufacturing operations.

COMPANIES

A million-dollar porcelain enameling plant, which will produce porcelain-on-steel interiors for refrigerators and other parts was opened recently by the Coolerator Company, an associate of the International Telephone and Telegraph Company.

All the enameling equipment, including the baffle furnace, dryers and sprayers are being provided by the **FERRO CORPORATION** of Cleveland, producers of



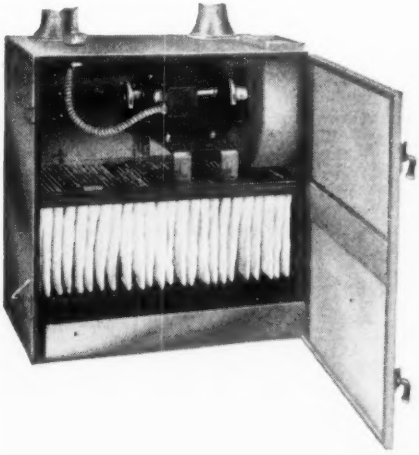
Atlanta Paint Plant of the Pittsburgh Plate Glass Company

HUSKY and FAST!

Long trouble-free service and ease of operation are the prime requisites for equipment of any kind.

HISEY Buffers - Polishers embody these features to such extent that they afford lowest cost per year with maximum production.

They are made from small bench types up to 30 H.P. Pedestal types. There is a size and type particularly suited to your requirements. Let us show you.

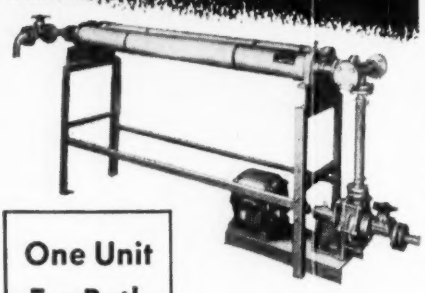


These new HISEY Dust Collectors fill a long felt need for efficient dust collecting at reasonable cost. They are made in four sizes which cover most applications and can be supplied with new machines or for machines already in service.

CATALOG 72-PB FREE ON REQUEST

Hisey THE HISEY-WOLF MACHINE CO.
CINCINNATI 8, OHIO
Division of The Cincinnati Electrical Tool Co.

Simplify
HEATING and COOLING of Plating Solutions



One Unit For Both

That's one big advantage of INDUSTRIAL'S Unit Heat Exchangers—you use the same unit for both heating and cooling. Maintaining the desired working temperature, by alternate heating and cooling in the one unit, simplifies controls and operation. The units are adaptable to either manual or automatic control.

INDUSTRIAL'S Unit Heat Exchangers are available complete with pump and stand, or tubes alone can be had for wall or ceiling mounting. A wide choice of capacity, too, is possible by using from one to six tubes in a unit. Special units are readily engineered to meet unusual capacity or space requirements.

Write for full recommendations

Water Demineralizers . Filters

INDUSTRIAL FILTER & PUMP MFG. CO.

5904 Ogden Ave., Chicago 50, Illinois

porcelain enamel frit and allied industrial equipment. In addition, Ferro is installing a mill room for grinding and a control laboratory as part of the porcelain enamel department.

ROBERTS ROUGE COMPANY, Stratford, Connecticut, has started a brick and steel constructed addition of 15,000 square feet of manufacturing space which is expected to be completed shortly. The building will be furnished with the latest equipment for producing a line of compounds new in their field, announcement of which will follow.

The **DU PONT COMPANY'S** finishes division has established a new Kansas City sales region, with headquarters at 4010 Washington Street, Kansas City, Mo., the company has announced. J. L. Masterson, formerly Cleveland regional sales manager, has been appointed sales manager of the new region.

Mr. Lounsbury, director of sales of the finishes division, said that the new region is being established to better service the rapidly expanding business in the area where a high rate of future growth is indicated.

THE METAL SPRAY CORPORATION, Milwaukee, Wisconsin is celebrating its 18th year in business with the addition of 15,000 square feet to its shop facilities. According to P. G. Dennison, President, it has developed and perfected techniques for building up worn dimensions and applying corrosion-resistant finishes on all types of metal products and equipment.

THE NOPCO CHEMICAL COMPANY, Harrison, N. J., has adopted a more distinctive and colorful finish for its drums which promises to be greatly advantageous to Nopco customers. The sparkling black drum with its brilliant golden-yellow center band will make quick identification of Nopco products possible in customers' plants and warehouses. Also, additional stencilling of shipping marks on the bung sides of the drums, as well as on the heads, is expected to help in identification.

The Marine and Power Plant Service Division, **MAGNUS CHEMICAL CO., INC.**, Dept. PF, Garwood, N. J., has been appointed by Long-Life, New York as distributor of their product Long-Life. Long-Life is a commutator and slip ring protector which is stated to increase brush life extensively. It also protects commutators and slip rings.

An important accessory to an air tight uniform developed by the U. S. Army Chemical Corps is the liquid-tight glove made by **THE PIONEER RUBBER COMPANY** of Willard, Ohio. Like the suit, these gloves are made of an impermeable compound which renders them resistant to damage from oils, acids and caustics. Another feature is the exclusive non-slip grip surface which assures a firm hold on wet slippery objects. These advantages are available to civilian industrial glove users in Pioneer Stanzoil gloves.

The **UDYLITE CORPORATION**, Detroit 11, Mich., has announced the opening of its new warehouse in Philadelphia. This newest addition to the Udylite sales network handles a complete line of products and chemicals.

The warehouse has approximately 10,000 sq. feet of floor space to facilitate service and assure complete stocks. It is located at 2818 Belgrade.

ELVIN P. CARNEY, chief control chemist of Metals Disintegrating Company, Inc., Elizabeth, N. J., was the guest at a dinner held in his honor, celebrating his twenty-five years of service with the company.

The gala affair was attended by over fifty of Mr. Carney's associates and the executives of the company. Highlight of the evening was the presentation by Mr. H. E. Hall, president, of a gold watch, suitably inscribed to Mr. Carney.

THE AMERICAN CHEMICAL PAINT COMPANY, Ambler, Pa., has announced the acquisition of office and plant facilities on the West Coast and expects to be operating there shortly.

The new ACP plant is located at Niles, Calif., about 25 miles southeast of San

If your product calls for stamping or roll forming aluminum or steel, cut your handling costs *now*. *Start* with the *finish*—with beautiful Arrow Pre-Coated Coils. The Arrow finish won't peel, chip, crack, fade, corrode—no matter how you torture it . . . provides maximum strength and rigidity, without sacrifice of flexibility . . . yet in most cases costs *less* than it costs to finish your own! Write for samples and complete information today.

ARROW METAL PRODUCTS CORPORATION
HASKELL, NEW JERSEY

Francisco. Present plans include the production of metal-working chemicals such as phosphate coating chemicals, pickling acid inhibitors and agricultural chemicals.

Heading up the Niles' ACP branch will be George H. Williamson, for many years associated with the American Chemical Paint Company in a supervisory capacity at its Detroit, Michigan office.

NEW POSITIONS

The appointment of **WILLIAM J. KINGSLEY** as assistant general sales manager of The Carborundum Company, has been announced by F. J. Tone, Jr., vice president, sales.

In his position, Mr. Kingsley will assist the general sales manager in all general sales activities of the Company. Carborundum has district sales offices in 12 principal cities throughout the country.

JAMES M. McWHIRTER, formerly Southern Works manager for the Pennsylvania Salt Manufacturing Co., has been appointed manager of the Wyandotte Works, it was announced today by W. F. Mitchell, vice president.

It was also announced that **HERMAN J. EICHENHOFER**, formerly assistant superintendent at Wyandotte, has been named superintendent of Pennsalt's new electrolytic chlorine, caustic soda and hydrochloric acid plant, now under construction at Calvert City.

Michigan Oven Company, Detroit, Mich. has announced the appointment of **A. N. MASON** and **JOHN KENNETH GIL-**

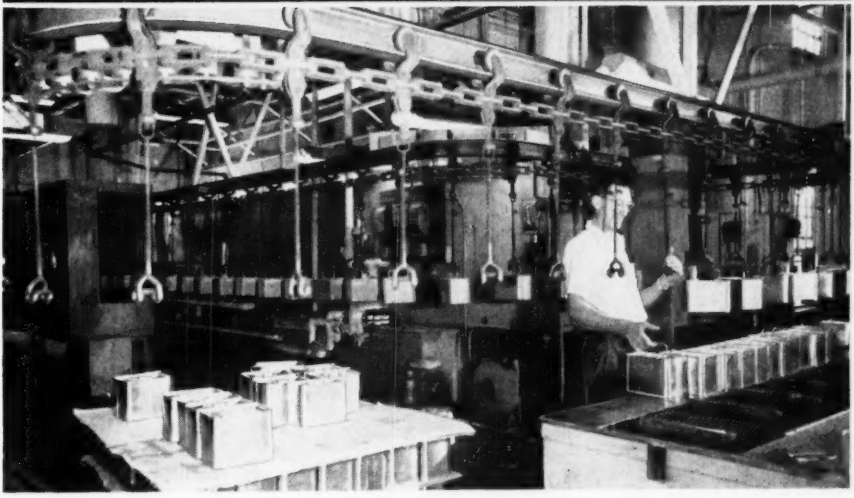
EARLY MORNING CONFERENCE ON ELECTROPLATING. A group of Tokyo Electroplaters recently entertained the editor of PRODUCTS FINISHING at Nikko, Japan, one of the scenic and historic spots in the country, and the site of the Furukawa Electric Company, a major electrolytic copper refining plant.

The accompanying photograph shows the group examining some of the data sheets and descriptive literature distributed at the recent American Electroplaters' Society Convention and Industrial Finishing Exposition held in Chicago. The members present were greatly interested in the many new developments discussed in the leaflets and catalogs.

Shown in the photo (from left to right—clockwise) are: Mr. J. Takahama, 69-year old editor of "Plating" (Japan) and leader of the group; Mr. T. Okazaki; Mr. Y. Takamizawa; Mr. M. Kojima; Mr. Y. Inoue; Dr. S. Tajima; Lt. Col. Blount; Mr. H. Hattori. Not shown in the photo: Mr. M. Fukui and Mr. N. Osawa.

(Photo courtesy N. Osawa, Osawa Barrel Plating Works, Tokyo)

HOW A KOCH COMPLETE *Conveyorized* FINISHING SYSTEM SAVES YOU MONEY



When KOCH handles complete responsibility for your finishing system, there's perfect dove-tailing of all components . . . no costly delays, no "reworks" at the last minute.

KOCH handles your entire job — from layout through installation — with engineering, fabrication and installation efficiency that assures you of top production at a lower cost.

Every installation is backed by nearly 80 years of metal-working experience. Consult KOCH now!

* * *

KOCH also builds baking ovens, spray booths, metal washing equipment and air makeup systems. Write for Folder K-10.

Phone, Wire or Write For Details!

GEORGE KOCH SONS, INC.

EVANSVILLE, INDIANA

LETT as its sales representatives in Metropolitan New York, including northern New Jersey.

MEETINGS

The **PHILADELPHIA BRANCH, A.E.S.,** has announced that its Annual Educational Session and Banquet will be held on Saturday, November 22, at the Broadwood Hotel.

Beginning at 1:30 P.M., the Educational Program will be as follows: Dr. R. B. Saltonstall, Technical Director, Udylite Corp., "Nickel Plating—Today and Tomorrow"; Edwin F. Ottens, Chemical Engineer, Philco Corp., "Practical Aspects of Zinc and Cadmium Plating"; Dr. W. L. McCracken, Director of Research, Detrex Corp., "Periodic Reverse and Ultra-Sonic Cleaning."

The Banquet will be at 7:00 P.M.

HONORS

PHILIP H. FISHER, son of Harry S. Fisher, a chemical engineer at the Tacoma plant of the Pennsylvania Salt Manufacturing Co., of Washington, has been awarded the 1952 college scholarship provided by George B. Beitzel, Pennsalt president.

The scholarship provides $300 a year for four years of study toward a bachelor's degree at an accredited college or university. This year's recipient attained very high grades in mathematics and science courses and plans to attend the University of Washington.

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can *rely* on
RANDOLPH
for prompt shipment
in any quantity of
Performance - Proved
Government Specification
FINISHES
Lacquers • Enamels • Dopes • Thinners
Clear Metal Finishes • Colored Lacquers
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Specialized Production Finishes
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CARLSTADT, NEW JERSEY

meetings
OF INTEREST TO FINISHERS

Nov. 10-13. Semi-Annual Meeting, National Electrical Manufacturers Assn., Haddon Hall Hotel, Atlantic City, New Jersey.

Nov. 17-19. 64th Annual Convention, National Paint, Varnish and Lacquer Association, Palmer House, Chicago, Illinois.

Nov. 18-22. 17th Annual Paint Industries' Show, Palmer House, Chicago, Illinois.

Nov. 20-22. 30th Annual Meeting, Federation of Paint and Varnish Production Clubs, Palmer House, Chicago, Illinois.

Nov. 20-21. Midwest Quality Control Conference, American Society for Quality Control, Claypool Hotel, Indianapolis, Indiana.

Dec. 5. Detroit Branch, A. E. S., Annual Educational Session.

Dec. 6. Detroit Branch, A. E. S., Annual Banquet.

Dec. 12. Newark Branch, A. E. S., Annual Educational Session.

Dec. 13. Newark Branch, A. E. S., Christmas Party and Banquet, 7 P. M., Robert Treat Hotel.

January 24, 1953. Grand Rapids Branch A. E. S. Annual Educational Session (2 P. M.), **and Banquet** (7 P. M.), Pantlind Hotel.

Jan. 31, Annual Meeting, Educational Session and Banquet, Chicago Branch, American Electroplaters' Society, Conrad Hilton Hotel, Chicago, Illinois. Tickets, $10.00 per person, may be obtained from Rudy Hazucha, banquet chairman.

Apr. 18. Annual Technical Session and Banquet, Boston Branch, A.E.S., Hotel Statler, Boston, Massachusetts.

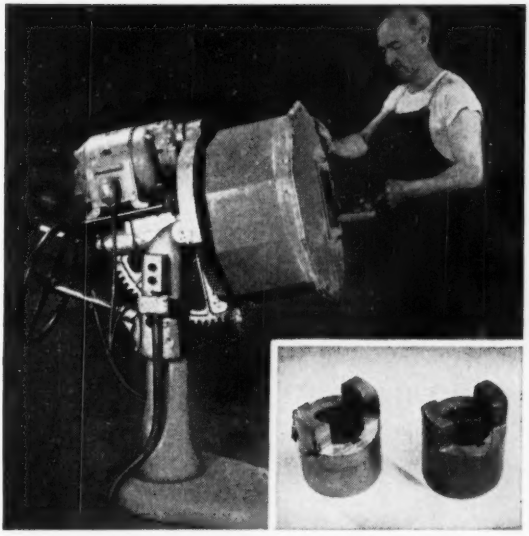
DEBURRING PRODUCTION *increased* 85%

AT BAKER-RAULANG

Leading Manufacturer Of Electric Lift Trucks

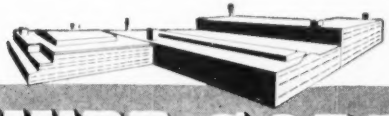
with

GLOBE TILTING TUMBLING BARRELS



Insulating bushings were formerly deburred with emery wheels at a rate of 300 per hour. With use of a Globe Tilting Tumbling Barrel, production was stepped up to 2000 pieces per hour. In addition to an 85% production increase, the tumbling barrel released two men for work in other departments.

Extra economies are obtained by tumbling odd shaped pieces difficult to deburr with hand wheels. With the Globe Tumbling Barrel, Baker-Raulang has doubled deburring production, and is obtaining finer finishes, using only 3 men in place of 5 men formerly required.



FREE EXPERIMENTAL SERVICE

Let Globe's experimental engineering service analyze your finishing problems. Send samples of parts and completed piece to show finish desired and Globe will provide detailed finishing recommendations. Write today! No obligation, of course.

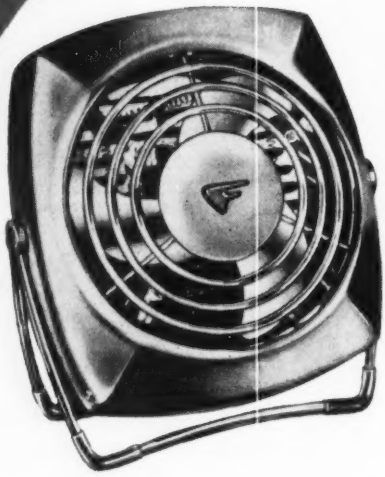
HUPP CORPORATION

GLOBE STAMPING DIVISION

1250 WEST 76th STREET • CLEVELAND 2, OHIO

SERVING INDUSTRY SINCE 1902

Finishes

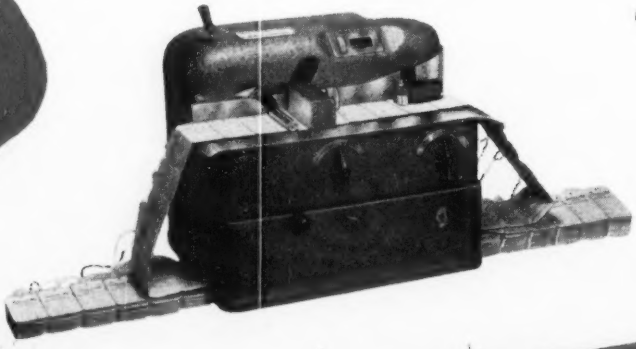


The Fresh'nd-Aire Heaterette is a heater-fan designed to provide year-round comfort. Its grill is chromium plated and the body is finished in tan with brown trim for the 1320 watt unit; cream with burgundy trim for the 1620 watt unit. The enameled parts are first degreased, phosphatized, and then painted electrostatically.

(Photo courtesy Fresh'nd-Air Company, Chicago 1, Ill.)

This Rotary Tab and Label Imprinting Machine was engineered for both appearance and service. Designated the American 400, it operates on the liquid duplicating principle. The machine has a light blue crackle finish.

(Photo courtesy American Tag Company, Belleville 9, N. J.)



that aid in appearance and utility

This "Office of the Year" award was established by Andrew Geyer and is presented by Office Management and Equipment. The silhouetted design is executed in bronze, silver plated, and mounted on ebony finished walnut.

(Photo courtesy Medallic Art Company, New York, N. Y.)

This automatic washer and dryer is designed to fit not only into a basement but also into a kitchen. For the washer, the interior cylinder has two coats of blue speckle, the tub one coat of blue, and the top panel a blue undercoat and white top coat, all porcelain enamel. The cabinet has a gray undercoat and white top coat of paint while the clothes door, and ring and bar are finished in decorative chrome. The dryer has the same finishing system as the washer with the exception that the cylinder is painted with two coats of heat and abrasion resistant paint.

(Photo courtesy Bendix Home Appliances, South Bend, Indiana.)

New Spray Booth design shortens booth cleaning time

...OFFERS 3 OTHER IMPROVEMENTS

Here's how...

Binks NEW Dynaprecipitor Spray Booth uses a new combination of washing and centrifugal force to remove pigment from overspray and thereby shorten booth cleaning time. Waterwashes at the points marked ● in the illustration scrub out the paint particles suspended in the air.

By making sudden changes in the direction of air flow at the points marked ★, centrifugal force flings the remaining paint particles from the air onto the booth's washed surfaces.

Binks new booth shortens cleaning time because there are no areas on the water curtains or baffle plates where paint can build up. Every surface the pigment contacts is constantly flushed. Cascading water washes all pigment down into the collection pan.

Binks new booth shortens cleaning time because the new self-scouring baffle plates and major water curtain can be quickly removed without tools for maintenance and inspection.

What's more—Binks new spray booth also gives you...

Floor space economy. The collection pan on this booth occupies less floor space. It still contains, however, ample capacity for the collection of heavy solids and light pigments in its front section. These solids and pigments are removed by skimming. Notice the divider plate that prevents their recirculation.

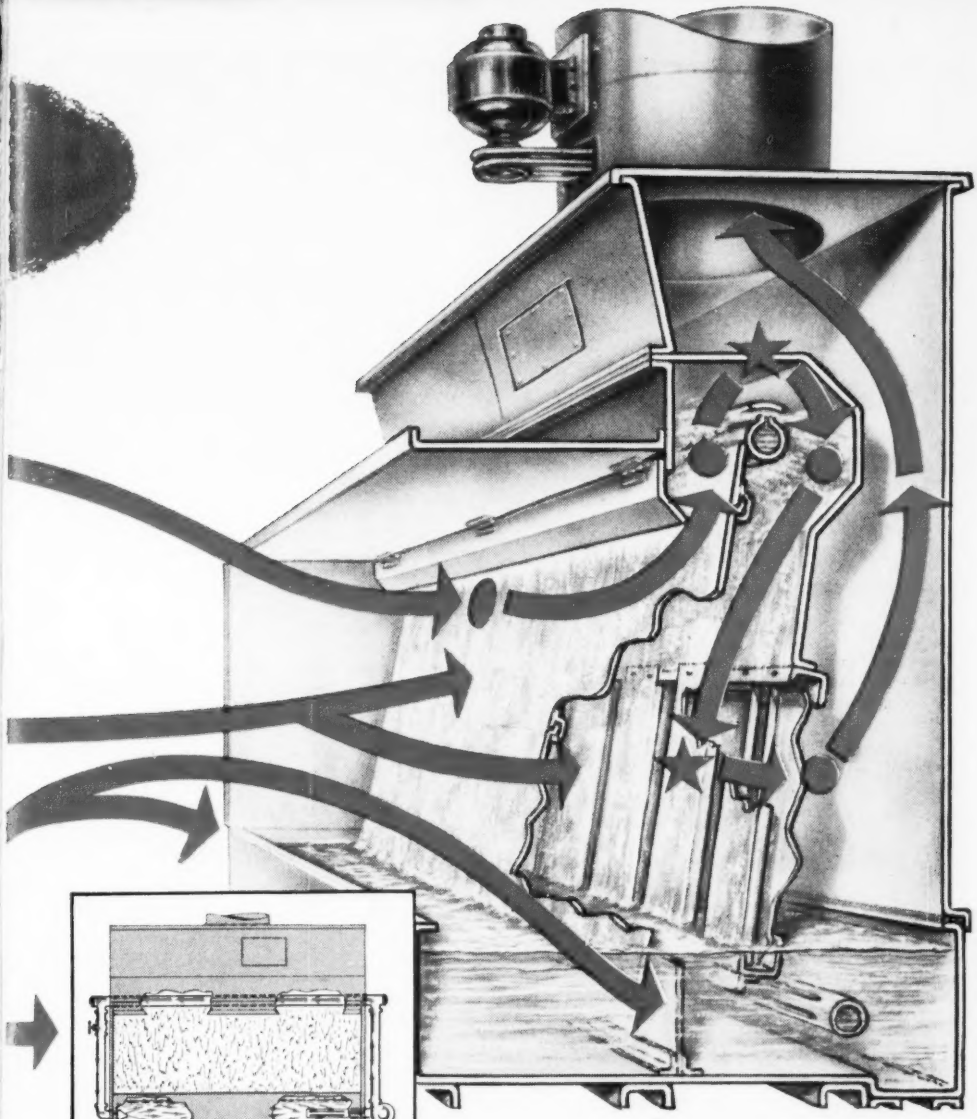
Water Economy. The same water is used over and over again. The only make-up water needed is that required to compensate for slight evaporation.

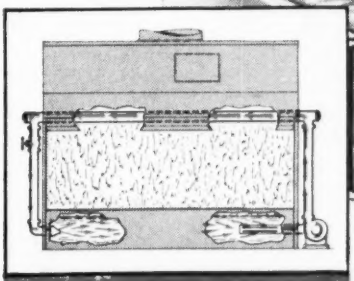
Protection against fire and explosion hazard. This booth removes pigment and vehicle so efficiently that Binks guarantees every Dynaprecipitor installation to exceed the requirements of fire, health, and state authorities.

Send for your FREE copy of Bulletin DUC...

shows how you can save time and money with this new booth. Facts that back each claim are thoroughly explained with pictures and sketches. See your Binks distributor or write to:

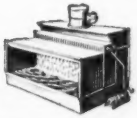
Binks Manufacturing Company
3118-40 Carroll Ave., Chicago 12, Ill.

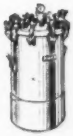




Binks

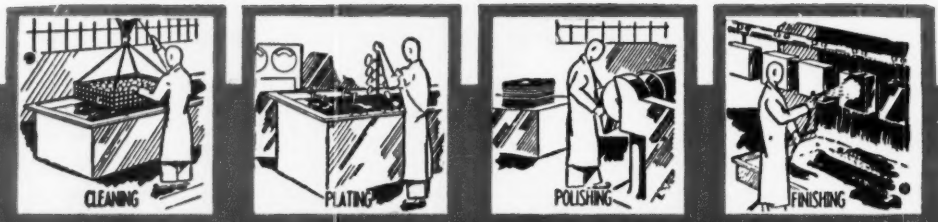
EVERYTHING FOR SPRAY PAINTING





GUNS • SPRAY BOOTHS • MATERIAL TANKS • EXTRACTORS & ACCESSORIES

REPRESENTATIVES IN PRINCIPAL U. S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY



New • EQUIPMENT • MATERIALS • PROCESSES

Deburring Machine for Jet Turbine Disc-Slots

Announcement is made by the Murray-Way Corporation, P. O. Box 180, Birmingham, Mich., of the development of a versatile polishing head which, while developed for turbine disc-slot operation, may be converted by a few simple adjustments to a wide range of uses.

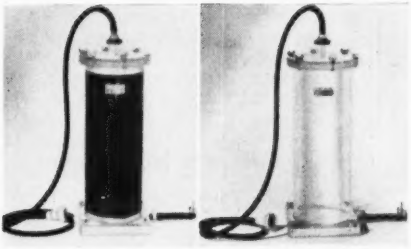
Especially designed for fast, accurate and economical deburring in jet manufacturing, it incorporates several of the famous Murray-Way universal-positioning features.

The head may be used with either wheels or buffs and is stated to be exceptionally compact in design, allowing the use of two, three or four heads as the work requires.

Deburring Machine for Jet Turbine Disc-Slots.

Pup Ion-Exchange Reactor and Regenerator Tube

Announcement is made of the availability of an ion-exchange reactor, by the Pup Reactor Division, of Enley Products, Inc., 254 Pearl Street, New York 38, N. Y. Claimed by the manufacturer to be capable of doing [illegible] thing in ion-[illegible] unit is descr[illegible] uid conditioni[illegible] for servicing [illegible] field of ion-exch[illegible] the removal of so[illegible] gaseous media.



Pup Ion-Exchange Reactor (left) and Regenerator Tube

The Reactor is constructed throughout of high temperature acrylic resin and therefore offers good chemical resistance plus clarity. It can be used individually or in multiples for simple or complex processes.

A companion to the Reactor is the Pup Regenerator Tube which is stated to facilitate easy and fast regeneration by the user. This tube may be used by simply attaching it to the Reactor, and allows for backwashing of resins.

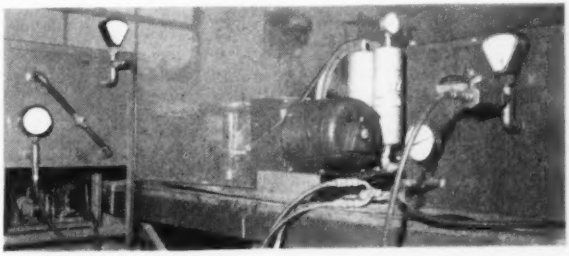
Airless Atomization

Bede Products, Inc., 4317-A Ridge Road, Cleveland 9, Ohio, has announced the development of a spray painting system which does not depend upon compressed air for atomization, but utilizes relatively high fluid pressures and temperatures.

Components of the Air Atomization System consist of a high-pressure piston pump, a heating unit, and a special spray gun which is merely a housing for the trigger. Through the use of high temperatures, viscosity is greatly lowered and a lower solvent ratio can therefore be used. Further, part of the solvent is evaporated but prevented from boiling due to the high pressure. The vapor pressure thus set up, together with the high fluid pressure accomplish atomization through a small nozzle such as is used for water solutions.

Operating temperatures range from 160-220 deg. F.; 160-165 degrees being used for lacquers and 180-220 degrees for synthetics. Operating pressure is from 300 to 600 p.s.i. According to the manufacturer, the lack of atomized air results in no rebound of spray and waste is therefore drastically reduced. Exhaust air requirements are also lowered due to lower solvent content and lack of rebounding paint.

No specific lacquer or enamel formulation, except for solvent, need be used. This system, it is claimed, takes all adjustments out of the spray operator's control. It can be used for any paint that will take high temperature, and thinner films or any film thickness can be achieved with good flow out.



Components of the Airless Atomization system, from left to right: heater and pump for lacquer, pump for enamel, special spray gun, and heater for enamel.

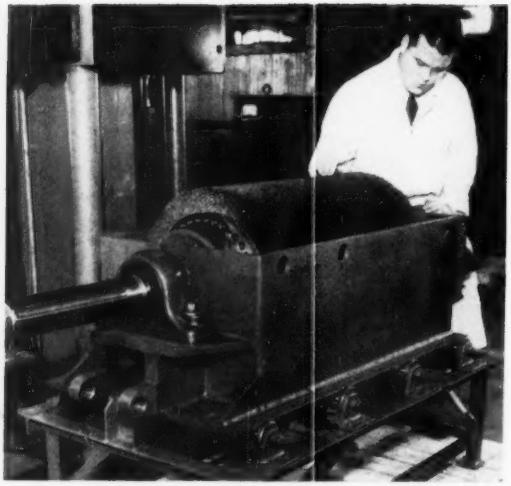
Speedylectric Model JC-10

Livingstone Engineering Company, 100 Grove St. Worcester 5, Mass., has announced design changes and improvements in the Speedylectric Steam-Jet Cleaner JC-10. The smallest portable unit of the steam jet cleaner line, it is stated to have operating pressures up to 150 p.s.i. and close control of steam detergent mixtures.

The cleaner uses steam from a built-in high pressure boiler which is claimed to be completely safe since the boiler water itself is the electric resistant element and if there is no water, no current can pass.

Osborn Brush Assembly Units

The Technical Department of The Osborn Manufacturing Company, Cleveland, Ohio, has developed a line of special Brush Assembly Units for quick and ac-



Osborn Brush Assembly Unit

curate insertion and removal from brushing machines.

Designed to protect the brushes against the hazards of possible damage and to facilitate handling larger-size brushes, the unit is a complete package equipped with brushes, bearings, guards, guides, and servicing adjustments.

When servicing the unit, to replace the brush part for example, the double bearing end of the shaft need not be disturbed. After the brush unit has been detached from the drive and removed from its position, the single pillow block bearing may easily be loosened from its base. This permits that end of the brush and the loosened bearing block to be lifted from the box guard mounting, and be swung upward about a pivot near the double pillow block bearings. Holes in the box guard mounting can be used for hoisting.

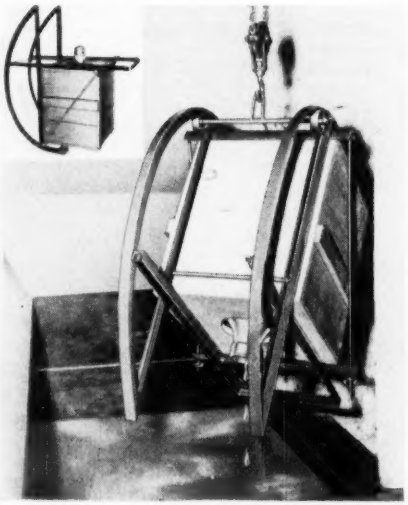
Barnstead Central Supply Still

The Barnstead Still & Sterilizer Co., 130 Lanesville Terrace, Forest Hills, Boston 31, Mass., has announced the availability of a central supply still. Engineered for small wall space, the still design consists of the Barnstead type "Q," pyrogen-removing water still and a handy 12 gallon Pyrex tank. With a capacity of 10 g.p.h., the still can easily be attached to walls through the use of unions which can be readily loosened. The model, now in full production, has been proven in hospitals, and scientific laboratories.

Emptying Attachment for Carboy Rocker

The Morse Mfg. Co., 125 Dickerson, Syracuse 2, N. Y., has announced an attachment that allows a carboy rocker to hang from a chain hoist or crane over a vat until emptied. Stated to get the last drop from a carboy safely and efficiently, the attachment, with two wheels which run on the rocker parts, has a lock hook which holds the carboy rocker in the upside-down position. Simple leverage will right the carboy rocker. The rocker is equipped with wheels to serve as combination truck and rocker, and will handle conventional size acid carboys from 18 by 18 by 23 to 20 by 20 by 25. Adjustable steel rods connect the angle steel braces to tighten their grip on the carboy.

Emptying Attachment on Carboy Rocker



Aluminum and Tin Cleaner

Oakite Products, Inc., 120 Rector St., New York 6, N. Y., manufacturers of specialized cleaning and allied products, have announced the development of Oakite Composition No. 80-A, a material designed for use wherever a cleaner offering a high degree of safety to aluminum, tin or other soft metals is required.

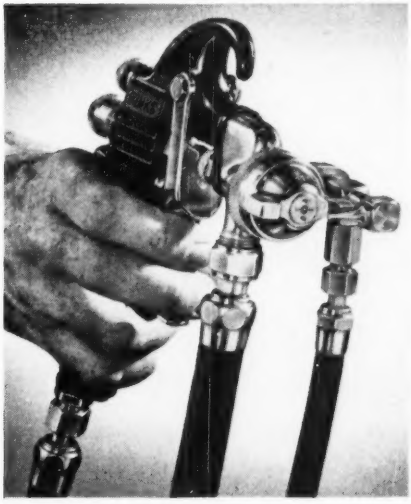
Oakite Composition No. 80-A, the manufacturers state, has wide applications on a broad variety of work in aircraft and metal plants where exceptional cleaning ability and thorough safety in use are essential. Material may be used in soak tanks or pressure spray washing machines, is readily soluble in hot water, and rinses easily with hot or cold water. It does not exhibit any tendency to foam excessively, it is claimed.

Catalyst Spray Gun

A spray gun has been developed by the Binks Manufacturing Company, 3122 Carroll Ave., Chicago 12, Ill., for the application of the recently developed epon resin paints. With this gun, a catalyst is mixed with the paint a split second before it strikes the surface, the blending of the paint and the catalyst being accomplished with a dual-feed head on the gun.

The spray gun is a heavy-duty produc-

Catalyst Spray Gun



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Makes frequent cleaning easy. Pre-mixed, ready to use, safe to store. Saves time, labor, no flaking off. Spray or brush on clean booth. When desired, operator peels off overspray in sheets. Advocated by insurance companies.

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HYGRADE'S STERLING CREME

protects hands and arms from paint, grease, ink, etc. penetrating skin. Soil washes off easily without harsh solvents or cleaners.

40 lb. pail $12.00. 12-7 oz. jars $6.00.

HYGRADE'S STERLING CLEANER

(WATERLESS HAND CLEANER)

dissolves grease, grime, fresh paint, tar, printers' ink, shellac, mastic cement, etc. without water.

40 lb. pail $9.00. 12-14 oz. jars $7.08.

All prices f.o.b. Buffalo.

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FOOD PRODUCTS CORP.

Industrial Div., 18 Stetson St.,

Buffalo 6, N. Y.

tion gun with the precision catalyst feed system added. The hookup for the catalyst painting system consists of the gun, an air line, and lines for paint and catalyst; two pressure tanks. To assure a correct feed-ratio of catalyst to paint, the same air pressure is used on both the catalyst and paint tanks.

Corrosion-Resistant Tank Liners

Corrosion-resistant tank liners made of Agilene and Agilide are now offered by the American Agile Corporation, P. O. Box 168, Bedford, Ohio.

These tank liners, which are of fully welded construction, are made to customers' specifications and can be furnished complete with drain and overflows, flanges, fittings and valves thus permitting incorporation into existing pipe lines and installations.

The chemical inertness of Agilene or Agilide and the welding method employed in the fabrications of such tank liners are stated to guarantee a leak-proof liner and reduces maintenance and replacement costs of storage, make-up, and plating tanks.

Scotch Tape No. 850

A transparent pressure-sensitive tape, only 2 mils thick, was announced for industrial and defense production use by Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul 6, Minn.

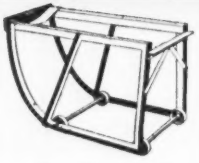
This tape, Scotch brand pressure-sensitive tape No. 850, is made with a polyester film backing that is claimed to be superior to most existing plastics in heat and chemical resistance.

The tape is stated to possess excellent resistance to acids, alkalies, acetones, ketones, hydrocarbons, esters, and other common solvents and is expected to find wide use for splicing, protecting, reinforcing, edging, covering and masking. It is available in standard ¼- to 1-inch widths on 2,592-inch rolls.

Lucoflex Ventilating Fan

The American Lucoflex Co., 1 East 57th Street, New York 22, N. Y., has announced the application of its hard vinyl industrial plastic to industrial fans and ventilating equipment. This plastic, it is stated, retains its original toughness through any chemical atmosphere without crack-

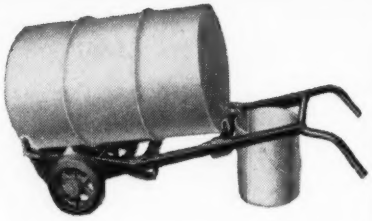
America's Largest Line of { DRUM AND BARREL HANDLING EQUIPMENT FOR QUALITY, PRICE & SERVICE


No. 40 $15.90

No. 41 $4.00

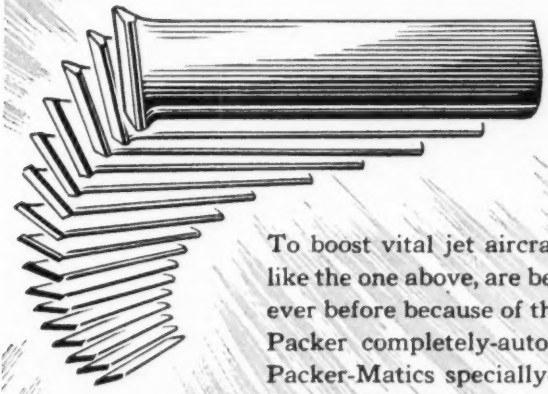
No. 44 $36.20

No. 10 $20.70


The Model 100 Hand Truck handles all kinds of drums and barrels, as well as boxes, refrigerators, etc. The Width at wheels 21", Length 60", Capacity 1000 lbs., Weight 80 lbs. Price: rubber tired wheels $52.30, steel wheels $44.20.

MORSE MANUFACTURING CO., INC. 125 Dickerson Street Syracuse 2, N. Y.

Jet blade production increased



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To boost vital jet aircraft production jet blades like the one above, are being produced faster than ever before because of the speed and efficiency of Packer completely-automatic buffing machines. Packer-Matics specially-designed to do this one job are finishing at a high rate of production, to exacting specifications, without a single finishing reject. Packer machines are also hard at work buffing, grinding, or de-burring reciprocating engine parts for planes, tanks, and vehicles, casings for shells, and many more items essential to defense. If higher finishing room production can help you, whatever you make, write today for more information about the versatility of continuous, indexing, or straight-line Packer-Matics: the Packer Machine Company, 400 Center St., Meriden, Conn.

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Large Industrial Fan made of Lucoflex.

ing or aging. There are no plasticizers present to bleed out. According to the manufacturer, Lucoflex is non-inflammable, and has outstanding thermal, chemical and physical properties. It is dimensionally stable and has good electrical properties as well as being highly serviceable and versatile in fabrication.

Wire Cup Brush

A wire cup brush with replaceable filler has been developed by Hewitt-Robins, Inc., Buffalo 5, N. Y., for the removal of rust, scale, paint and welding slag from railroad equipment, tanks, gears and other metal surfaces.

The brush consists of inner and outer metal adapters with a replaceable cup-shaped filler in which the wire bristles are anchored in place with rubber. It is expected to be more economical because the metal adapters need be purchased only once. The cup shaped filler can be replaced a limitless number of times. The brush is stated to have improved balance, shock absorption and bristle retention.

Dip Painting Process

An automotically controlled, conveyorized dipping process for quantity production of baked enamel and lacquer finishes was announced by the Apex Stamping Company, 70 Marshall Street, Newark, N. J.

It is claimed that due to this development, known as the Steingetz System, the paint loss which occurs in the conventional spray method for enamel finishes, has been completely eliminated. The Steingetz System has been licensed exclusively to the Apex Stamping Company.

Other advantages of this system are stated to be controlled uniformity, complete overall coverage, thorough baking, and the elimination of drip and tear marks.

Burdett Line Burner

A recent announcement by the Burdett Manufacturing Company, 3433 W. Madison St., Chicago 24, Ill., discloses the development of what is said to be a more

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Nancy's spent too much time washing and dressing dolly to have her fouled up . . . and you, as a plater, have invested too much time and money cleaning your metal to put it into a bath of questionable purity.

Red Label Darco S-51 quickly adsorbs impurities that would otherwise be deposited on the freshly cleaned work. It conserves scarce metals and gives you a better job with thinner deposits.

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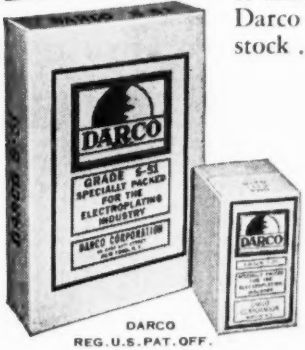
Red Label Darco S-51 is specially treated for use in plating—the only carbon that meets the benzol-mercury test! It's easy to handle . . . easy to wet . . . easy to make into a slurry. Place your order for Red Label Darco S-51 today. Nearly all suppliers carry Darco in stock . . . *so don't accept substitutes!*



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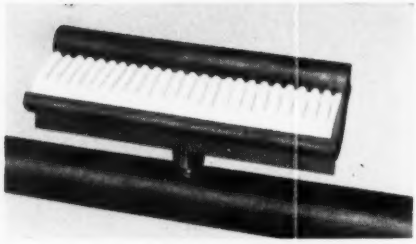

Burdett Line Burner

flexible and efficient adaptation of the Burdett principle of radiant heating.

Named "Radi-Heat," it is stated to incorporate several important advances, among which are maximum rate of heat transfer, complete combustion with resulting fuel economy; reduced processing time; maximum uniformity of product; and mimimum low cost maintenance.

According to the manufacturer, some of the advantages are the wide fanning radiation of the refractory, accomplished by the open-faced design; burner will not backfire or blow itself out at any manifold pressure; and the gas retaining section of refractory gives faster light-up, thereby reducing amount of raw gas admitted to oven.

NEW BOOKS

Corrosion Testing Procedures. By F. A. Champion. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, New York. 340 pages. Illustrated. Price, $6.25.

Written for the technician mainly concerned with practical problems in the corrosion of metals in service and the production of a metal surface of adequate corrosion protection, the book is divided into five stages, in each of which various alternate methods of procedure are described.

The stages into which the complete text has been divided are choice and preparation of metal and corrosive; exposure of the metal to environment; cleaning preparatory to examination; examination and expression and interpretation of results.

Well illustrated with photographs and diagrams and well marked as to references used, this book can be an excellent aid to the corrosion investigator.

1952 Finishing Handbook & Directory. Published by Sawell Publications Ltd., 4 Ludgate Circus, London, E. C. 4, England. 600 pages. Illustrated. Price, 15 shillings ($2.10).

The culmination of a year's work of revision, this issue of the Finishing Handbook & Directory is considerably larger than the previous one and is a mine of information.

In this year's edition, the sections in the front have been rearranged and several new ones have been added elsewhere.

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Pretreatment processes are featured first, followed by paint finishes. Continuing through the book, the reader will find further sections dealing with electroplating, galvanizing, and metal coloring. New sections deal, among other subjects, with marking processes, car finishes, and trick finishes.

Tables and data of interest and use to the finishing shop are again included, and cover metallic elements and their properties, pH values for electroplating solutions, number of gallons capacity of circular tanks of a given depth and diameter, standard gauges, temperature conversion tables, and a list of substances with common and chemical names and formulas.

Lead in Modern Industry. Published by the Lead Industries Association, 420 Lexington Avenue, New York 17, New York. 230 pages fully illustrated. Price, $1.50.

The only book currently available devoted exclusively to the manufacture, applications and properties of lead, lead alloys and lead components. It is written to provide a broad picture to the public, and at the same time, serve as a handy reference source for those using lead and its products.

Of sufficiently technical nature to be of practical value to the engineer, the book is divided into twenty-eight chapters beginning with the history, production and various fabricating techniques of the metal. Separate chapters are devoted to the more important uses of lead. Corrosion resistance of lead and its alloys are fully described, complex operations being illustrated with drawings and photographs.

The book is well rounded out with the latest specifications for lead, lead alloys and lead products.

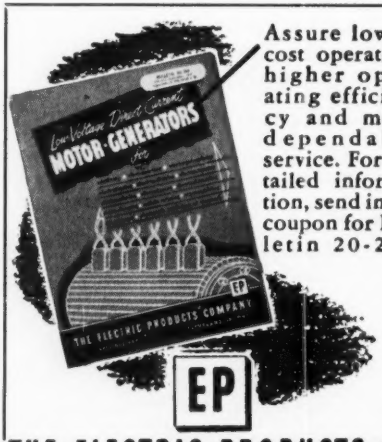
---

101 New Uses for Porcelain Enamel. Published by the Porcelain Enamel Institute, 1010 Vermont Ave., N. Y., Washington 5, D. C. Price, $6.00

Considered one of the most comprehensive business-provoking projects ever to be carried out by a national association for its membership, this publication lists 101 new commercially feasible applications of porcelain enamel. The scope of product suggestions is highly diversified, ranging from hog feeders and ship bulkheads to various types of hoppers, housing, jet engine parts, receptacles, tanks, towers, and area walls.

Specific advantages of porcelain enamel for each particular application are discussed, and sufficient marketing data are included to give a potential manufacturer a good clue to his possible success in locating and satisfying an existing market.

Analytical Methods for the Determination of Cyanides and Cyanates in Plating Wastes and in Effluents from Treatment Processes (A. E. S. Research Report Ser-



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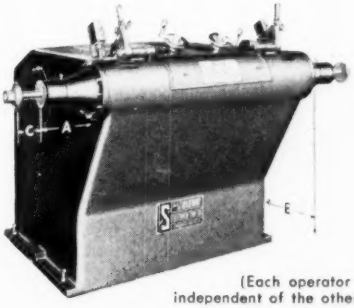

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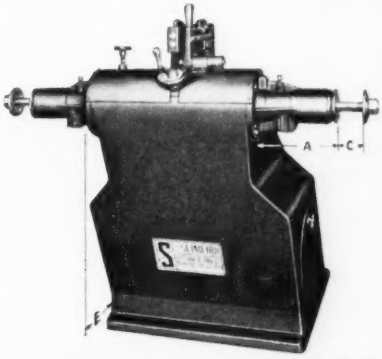

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ial No. 19). By Barnett F. Dodge, Walter Zabban, Earl J. Serfass and Robert B. Freeman. Published by the American Electroplaters' Society, 445 Broad Street, Newark, New Jersey. 28 pages. Illustrated. Price $0.65.

This book is divided into two parts, and presents the paper "Analytical Methods for the Determination of Cyanides in Plating Wastes and in Effluents from Treatment Processes" by E. J. Serfass, R. B. Freeman, B. F. Dodge and W. Zabban, and "Analytical Methods for the Determination of Cyanates in Plating Wastes and in Effluents from Treatment Processes" by B. F. Dodge and W. Zabban. These papers are clearly presented with graphs and tables, and equipment used is illustrated.

TITAN—System No. 41. Available from Walter J. Johnson, Inc., 125 E. 23rd St., New York, N. Y., or Stechert-Hafner, Inc., 31 E. 10th St., New York. N. Y. 511 pages. Illustrated. Price, $27.20.

This is the latest volume of the world-famous "Gmelin Handbuch" which contains the most comprehensive and up-to-date data on titanium, its alloys and compounds.

A complete review of the geology, geochemistry, metallurgy, chemistry, physics, and technology of titanium, the material is systematically arranged and critically reviewed, and includes 100 graphs and a 22-page index.

Forum Proceedings of the Porcelain Enamel Institute. Published by the Porcelain Enamel Institute, 1010 Vermont Ave., N. W., Washington 5, D. C. Cost, $5.00.

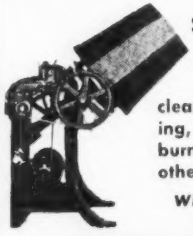
All papers and discussions presented at the 13th Annual Shop Practices Forum of the Porcelain Enamel Institute now are available in a single bound volume. Held last October at Ohio State University and attended by over 250 representatives of porcelain enamelers and their suppliers, the Forum was devoted to the latest techniques and developments in porcelain enamel production.

Practical Metallurgy for Engineers, Fifth Edition. Published by E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa. 599 pages. Illustrated. Price, $3.50.

This volume represents more than a year's work by the Houghton research staff to bring the previous (1943) edition up to date. It presents the latest standards and practices followed in the metal industry today and includes a discussion of future probabilities relating to new metals, new alloying elements, and new types of heat treatment.

Technical Reporting. By Joseph N. Ulman, Jr., Published by Henry Holt and Company, Inc., 383 Madison Ave., New York 17, N. Y. 290 pages. Price $4.75.

IS YOUR PROBLEM POLISHING?



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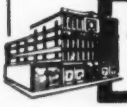

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Mr. Ulman, by training and experience a writer and an engineer, has been writing and editing engineering reports for many years. At present he is assistant professor of English at the Massachusetts Institute of Technology.

The handbook is written as a tool to help the reader master written communication within his specialized field of science or engineering. After an introduction on the importance of technical writing, the author reviews important fundamental principles and general procedure. The next few chapters are devoted to preparing various types of reports. Following chapters discuss mechanics, the use of tables and visual presentation of information. An appendix, filled with various types of examples, is included.

Detergents—what they are and what they do. By Donald Price, Ph. D., Technical Director, Oakite Products, Inc. Published by Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N. Y. Price $4.00.

This book brings detergents from the realm of specialized organic chemistry to the level of the average reader. It explains the hows and whys of detergency in simple, nontechnical terms, and reveals the chemical nature of the various groups of surface-active agents. The book illuminates the mechanism of their action in removing water hard-to-wet surfaces. It discusses among others the role of optical bleaches, builders and extenders.

The book will be welcome to chemists, students of chemistry, salesmen, purchasing agents and industrial users of detergents.

Finishing Engineer. Automation is featured in the first issue of the Finishing Engineer, a magazine for the metalworking industries, now published quarterly by the Metalwash Machinery Corporation, Elizabeth, N. J.

Succeeding issues of the Finishing Engineer will feature articles of special interest to the finishing industry.

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PRODUCT LITERATURE

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

Corrosion resistance for zinc plate. Unichrome dip and anozinc processes for producing corrosion-resisting, chromate conversion coatings are described in literature now available from United Chromium, Incorporated, 100 East 42nd Street, New York 17, N. Y. Unichrome dips produce clear, yellow, olive drab, brass-color, and black coatings on zinc and cadmium by simple chemical action. The Anozinc process is an electrolytic one used to produce clear, yellow, and black conversion coatings on zinc.

Coatingage. A six-page folder describing theory and operation of the Coatingage Model 600 has been released by Branson Instruments, Inc., 430 Fairfield Avenue, Stamford, Conn.

The portable instrument is used to measure the thickness of non-magnetic coatings on magnetic bases, and to detect pin-holes in non-conductive coatings on conductive bases. One of the most important applications for this gage has been the examination of corrosion-protective coatings for thickness and film continuity.

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"The Arco Hot Spray System—How it Fits into Your Finishing Operation" is the title of an informative 12-page booklet, available from The Arco Company, 7301 Bessemer Ave., Cleveland ,Ohio, specialists in paints and product finishing materials for industry.

Purpose of the booklet is to show the ease with which the Arco Hot Spray System, which is built around a low-priced and extremely simple paint-heating unit, can be inserted into existing spray systems or integrated with production-lines in the making.

Swift Salts. An informative folder on Swift polytherm blended liquid carburizing salts is now available from the Swift Industrial Chemical Co., Canton, Conn. Pointing out that a liquid carburizing bath can be successfully used for any application, the folder explains that Swift metal treating salts afford the distinct advantages of Swift polytherm blending as well as the simplified quenching and adaptibility of standard liquid baths.

The Electrodeposition of Nickel from Nickel Chloride Solutions is the title of a 28 page reprint available from International Nickel, Dept. EZ, New York 5, N. Y. With 5 charts, 5 tables and illustrations, it compares nickel deposited from all-chloride solution with that from ordinary sulfate electrolyte and finds them of equal protective value. However, the nickel deposited from the chloride solution is of finer grain, harder, stronger and somewhat less ductile.

The Barnstead Still & Sterilizer Co., 130 Lanesville Terrace, Forest Hills, Boston

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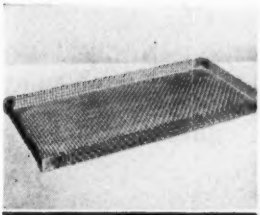

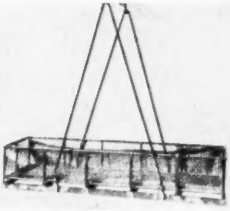

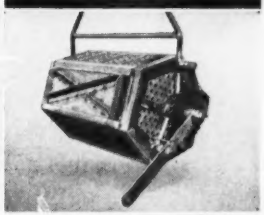

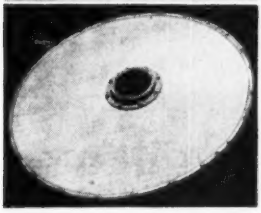

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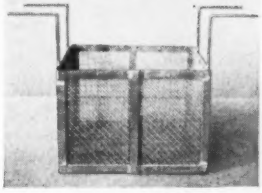

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OFFICES IN PRINCIPAL INDUSTRIAL CITIES

31 Mass., announces the publication of **Bulletin No. 125** which describes the Barnstead Purity Meter, an electronic testing device for determining the purity of either distilled or demineralized water.

The Barnstead Purity Meter is available with either platinum dipped, glass dip-cell or nickel pointed, hard rubber dip-cell.

A section of the bulletin is devoted to the Barnstead Conductivity Diverter, an automatic control device. Operated by a conductivity cell in the pure water line, this special controller-type Purity Meter will permit only water of predetermined purity to enter the storage tank.

Bulletin 68. A 12-page, colored bulletin entitled "Despatch Equipment for Metal Cleaning and Treating," is now available from the Despatch Oven Co., 619 S.E. 8th Street, Minneapolis 14, Minn. Printed in three colors and profusely illustrated, the brochure describes various types of washers which the company manufactures. Engineering features such as type of conveyor, methods of heating, and applications are given for the various models.

"Surface Active Agents for the Metalworking Industry." An 8-page, colored bulletin prepared as a guide to speed processing and lower production costs, is available from E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pennsylvania.

This bulletin lists many metalworking applications and benefits gained in actual productions through the use of surface active agents, and contains helpful suggestions for other applications. An illustrated chart outlining the physical properties of the leading agents is included.

Electric Grinders and Buffers. The Hisey-Wolf Machine Co., Cincinnati 8, Ohio, has released a 36-page, colored catalog **(No. 72)** which describes and illustrates its line of electric grinders and buffers. Information on combination grinders and buffers, polishers, dust collectors, dust hoods, and eye shields is presented, as well as specifications for all machines.

Bulletin RC-2. United Chromium, Incorporated, 100 East 42nd Street, New York 17, New York, has recently made available bulletin RC-2, which describes the properties and uses of Unichrome Coating 218X, a vinyl plastisol material. Coating 218X is suitable for coating plating and conveyor racks, degreasing and dipping baskets, plating barrels, drainboards, ductwork, agitators, tank grids, piping, and other equipment.

R54 Universal Cosmowheels. A six page booklet is being made available by the Chicago Rubber Company, 2620 N. Clybourn Avenue, Chicago 14, Illinois, which depicts and describes the R-54 contact wheel. Included in the booklet is a blown-up diagram of the wheel and a chart showing recommended uses at various speeds, for various wheels.

Platecoils Brochure. The how and why of the savings made by platecoils in heating and cooling procedures are described in detail in a 20-page brochure just released by the Kold-Hold Manufacturing Company, Lansing 4, Michigan. The brochure shows how platecoils have replaced pipe coils at a savings throughout industry and the variety of heating and cooling processes described show the diversity of application of the platecoils.

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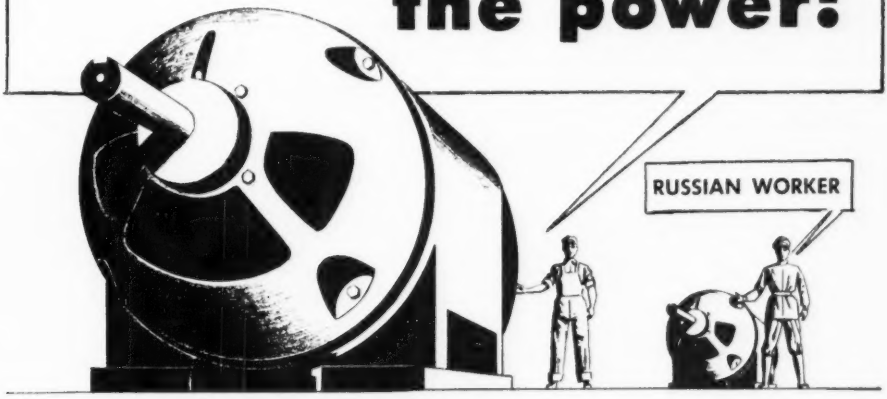

How does America do it?

Why does the American worker have the help of about 7 times as many kilowatt-hours of electric power as is available to the Russian worker?

How can we Americans produce over 40% of the world's goods with less than 6% of the world's people? Why is the American output per-man-hour still growing faster and faster?

The answers are not hard to find. Says Ralph J. Cordiner, president of the General Electric Company: "The greatest impetus for forward movement still comes when individuals are free to plan and carry out their own ideas without government coercion or unnecessary regulation."

Including 1952, private industry in the last 7 years will have invested over 150 billion dollars in new plant and equipment. This contrasts with Federal Government investment of not much more than 12 billion for similar purposes.

Back of all this progress in private industry is the American system of competition. In America we do not just compete for public office; we also compete in technology, competency of management, individual initiative and distribution—the latter including selling and advertising in all their varied forms.

Our kind of competition promotes the growth of more businesses and industries—and this means more jobs.

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This Opportunity Section is available for classified advertisements. For advertising rates and other information address:

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Nickel Plating plant suitable for tubular furniture. Write full details Box No. 113, c/o PRODUCTS FINISHING, 431 Main St., Cincinnati 2, Ohio.

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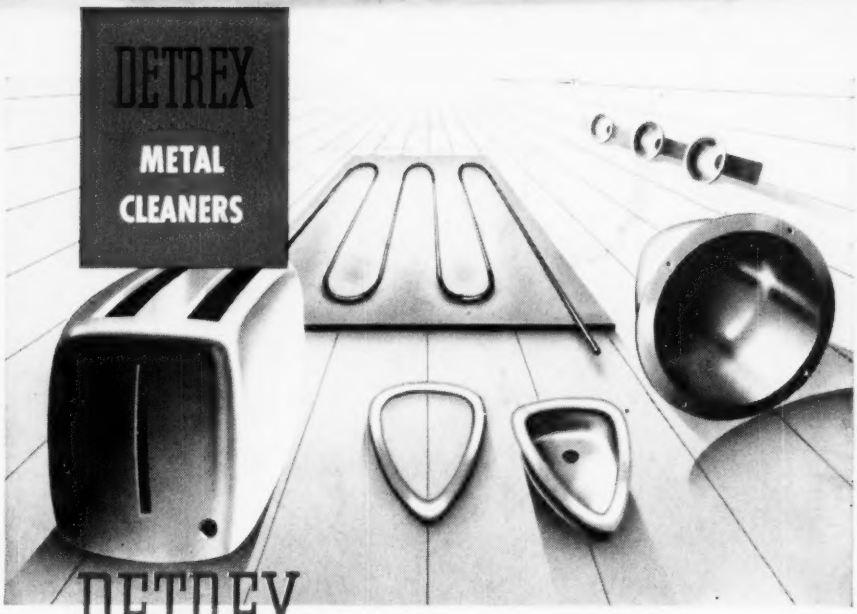

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